U. S. Government RESEARCH REPORTS

May 16, 1961
Vol. 35, No. 5

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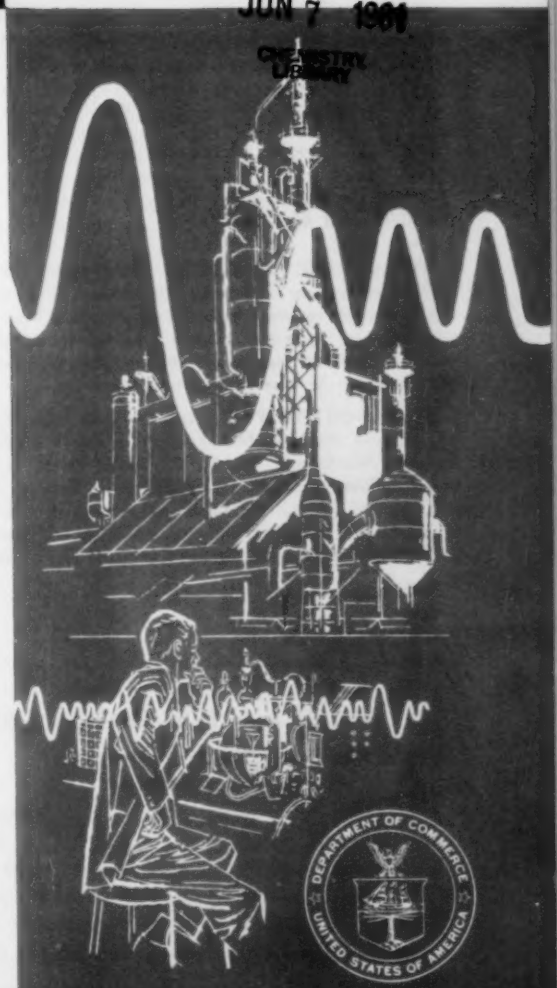

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X-ray mass attenuation coefficients in the 1.49 to 11.9 kev range. Jan 60. 62p. (PB 171 527) $1.75 620

SOCIAL SCIENCES

An operations research study of the dissemination and use of recorded scientific information in three parts: I. Journal reading by physicists and chemists. II. The cost of journal publications. III. The effect of condensation on comprehension of journal articles. Dec 60. 74p. (PB 171 503) $2.00 638

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Vol. 35, No. 5 Pages 533 - 680 May 16, 1961

BIBLIOGRAPHY

Armed Services Technical Information Agency, Arlington, Va.
MAINTENANCE AND MAINTAINABILITY. AN ASTIA REPORT BIBLIOGRAPHY. Attachment to Office of Defense Research and Engineering MENEX: Maintenance Engineering Exchange Bulletin, Dec 60, 77p. 411 refs. AD-247 300.
Order from OTS $2.00 PB 171 518

The reference in this bibliography represent those reports in ASTIA's AD collection (1953 to the present) pertaining to the following phases of maintenance engineering and maintainability: (1) the general concepts, principles, and related aspects, and (2) studies on maintenance and maintainability of equipment of all types. References are arranged in 2 parts, according to these broad categories, with further breakdown by specific type of equipment. Entries appear only once, under the subject area primarily indicated by the contents of the report. Within each category, reports published by Department of Defense contractors are listed alphabetically by source, contract, and date; military reports are alphabetically arranged, within each category, by source and title. This arrangement permits the reader to follow the continuity of research completed by a given activity and provides an approach for reviewing future reports through use of the source index in ASTIA's Cumulative Index.

Office of Technical Services, Dept. of Commerce, Washington, D. C.
COOLING AND COOLANTS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT, TURBINES AND REACTORS. Jan 61, 17p. 263 refs. OTS Selective Bibliography SB-449.
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Lists PB reports, AEC reports and translations added to the OTS collection during 1950 to Jan 61. Contains information on the various methods of cooling (evaporative, transpiration, air-cooling, etc.); cooling of diesel engines, aircraft engines, turbine blades, clutches, and rocket motors. (AEC reports cover reactor cooling and coolants). Also includes reports on spot cooling of subminiature electronic equipment, vacuum tubes, transformers, digital computers, semiconductors, and electronic equipment in general. (Author)

ASTRONOMY

Aeronautical Research Lab., Air Force Research Div., Wright-Patterson AFB, Ohio.
A COMPARISON OF THE PHOTOGRAPHIC DETECTIVITIES ATTAINABLE WITH AND WITHOUT ELECTRONIC LIGHT INTENSIFICATION, by Radames K. H. Gebel and Lee Devol. Technical note on Research on the Quantum Nature of Light. Oct 60, 28p. 17 refs. ARL Technical rept. 60-315.
Order from LC mi$2.70, ph$4.80 PB 150 322

A comparative mathematical analysis is made regarding the limits of performance of the closed circuit television type optical amplifying system, and of conventional methods, for obtaining and observing photographs of faint celestial bodies, having a magnitude comparable to that of the sky background. Primary attention is given to the cases in which detection is accomplished by visual observation of a photograph, but also the potentialities of electronic counting of the developed grains in a photographic emulsion, is considered. When using either conventional photography or photography aided by an image converter, the contrast between the celestial body and background, necessary for visual discrimination, is determined by the photographic emulsion or the limitations of the human eye, and an optimum exposure time exists. With the closed circuit television system the instrumental and sky backgrounds can be suppressed electronically. Then the brightness of the image of the celestial body increases as the exposure time, but the brightness of the remaining background fluctuations, being statistical in nature, increases only as the square root of the time. Thus, as long as the device is capable of effective storage and integration of the electronic charge image, the contrast increases as the square root of the exposure time, and the ability to detect increases also. (Author)

Chicago U., Ill.
BENDIX LUMICON RESEARCH, by W. A. Hiltner. Final rept. on Contract AF 19(604)4540. 19 Nov 60, 5p. AD-247 365.
Order from LC mi$1.80, ph$1.80 PB 153 452

Two stars, αLeo and αLyr were compared to a standard lamp at 16 wavelength band 50A wide from 3200 to 6400 Angstroms. A relative net-work of 25 stars were set up at different right ascensions. Photometric observations were made of 45 Northern Cepheids and 80 faint blud stars at the North Galactic pole. (Author)

Harvard Coll. Observatory, Cambridge, Mass.
RESEARCH DIRECTED TO THE STUDY OF PLANETARY ATMOSPHERES, by Donald H. Menzel and G. de Vaucouleurs. Final rept. on Contract AF 19(604)3074. 10 Oct 60, 15p. 9 refs. AFCRL TR-60-414; AD-246 546.
Order from LC mi$2.40, ph$3.30 PB 153 285

Several planetary investigations were carried out during the 2 1/2 years. Regional and integrated photometry of Mars has been done. The occultation of Regulus by Venus on July 7, 1959, was observed and information obtained on the scale height and its variation in the planet's atmosphere, and corrections to the ephemeris position of the planet were derived. Two heat detectors were studied with regard to obtaining pictures of the temperature distribution over the lunar surface; special instruments were constructed for observing the occultation of Regulus; and improved techniques of composite printing of planetary photographs were developed. Studies of the possibilities of conducting high resolution photography from a balloon-borne telescope were made. An extensive program for obtaining accurate coordinates of surface features on Mars was undertaken, based in part on composites made from the best available negatives taken at Mt. Wilson and Johannesburg. (Author)

Minnesota U. School of Physics, Minneapolis.
OBSERVATION OF THE SOLAR BREMSSTRAHLUNG BURST AT 1926 UT, 11 AUGUST 1960, by J. R. Winckler, T. C. May, and A. J. Masley. Rept. on Contract NASw-56. Oct 60, 11p. Technical rept. no. CR-32; AD-247 161.
Order from LC mi$2.40, ph$3.30 PB 153 444

An observation was made with balloon detectors of a radiation increase which can be identified with certainty as a burst of bremsstrahlung originating on the sun during a class 2+ flare. The observation was made simultaneously with identical detectors on a balloon at Minneapolis, Minnesota, at 45° geographic latitude and at Fort Churchill, Manitoba, Canada, at 58.5° geographic latitude and essentially at the same longitude of 95°W. The instruments consisted of an aluminum-walled ionization chamber filled with argon gas operating on the pulsing electrometer system, an aluminum Geiger counter, and a copper Geiger counter. The two counters were also electronically connected to form a vertical coincidence train. The readings of these instruments are shown for both geographic locations. The event is observed about equally on both ion chambers and both aluminum counters and with negligible response on the copper counters and the telescopes. The event cannot be due to primary charged particles as there is no geomagnetic effect observed between Minneapolis and Churchill. The ion/count ratio of about six times minimum corresponds to protons which would penetrate the copper counters and be observed as a coincidence count. There is no obvious local electron source which would account for these observations. The response of the aluminum instruments and not the copper ones shows this event to consist of low energy x-rays with a mean energy of approximately 30 kev. (Author)

New Hampshire U. [Durham].
THE 27-DAY RECURRENT VARIATIONS IN THE COSMIC-RAY INTENSITY, by M. A. Shea and J. A. Lockwood. [1960] 47p. 22 refs. AFCRL-TN-60-699.
Order from LC mi$3.30, ph$7.80 PB 153 878

An analysis has been made of the 27-day recurrent variations in cosmic-ray intensity from 1954 to 1959 using data obtained from nucleonic detectors at Mount Washington and Durham, New Hampshire. The relatioship between the planetary magnetic index, K_p, and the nucleonic intensity variations was also studied. Periodicities ranging from 24 to 31 days found during this interval indicate that the intensity variations are not necessarily associated with the central meridian passage of active solar regions. No consistent change was found in the length of the period with respect to the solar activity cycle. (Author)

Radio Observatory, Calif. Inst. of Tech., Owens Valley.
OBSERVATIONS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY RADIO OBSERVATORY, 1959. 1. A SOLAR OCCULTATION OF THE CRAB NEBULA AT A WAVELENGTH OF 12 METERS, by J. G. Bolton, G. J. Stanley, and B. G. Clark. Rept. on [Contract Nonr-220(19)]. 1959, 5p. 2 refs.
Order from LC mi$1.80, ph$1.80 PB 147 323

Radio Observatory, Calif. Inst. of Tech., Owens Valley.
OBSERVATIONS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY RADIO OBSERVATORY, 1959. 2. RADIO EMISSION FROM JUPITER AT A WAVELENGTH OF 31 CM, by J. A. Roberts and G. J. Stanley. Rept. on Contract Nonr-220(19). 1959, 14p. 20 refs. AD-236 749.
Order from LC mi$2.40, ph$3.30 PB 147 324

Radio emission from Jupiter was measured at a wavelength of 31 cm. The mean equivalent disk temperature is 5.5×10^3 deg K. Two possible sources of the radiation are discussed: free-free transitions in a Jovian corona, and synchrotron emission from a Jovian van Allen belt. (Author)

Radio Observatory, Calif. Inst. of Tech., Owens Valley.
OBSERVATIONS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY RADIO OBSERVATORY, 1959. 3. POSITIONS AND SUGGESTED IDENTIFICATIONS FOR THE RADIO STARS HYDRA-A AND HERCULES-A, by J. A. Roberts, J. G. Bolton, and D. E. Harris. Rept. on [Contract Nonr-220(19)]. [1959] 7p. 2 refs. AD-236 751.
Order from LC mi$1.80, ph$1.80 PB 147 325

Position measurements were made of 2 radio stars. The measurements confirm the identification of Hydra-A with a close pair of galaxies and suggest that Hercules-A may be a very distant elliptical.

Radio Observatory, Calif. Inst. of Tech., Owens Valley.
OBSERVATIONS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY RADIO OBSERVATORY, 1959. 4. A STUDY OF CENTAURUS-A/NGC 5128 AT 31 CM, by J. G. Bolton and B. G. Clark. Rept. on [Contract Nonr-220(19)]. [1959] 8p. 9 refs. AD-236 754.
Order from LC mi$1.80, ph$1.80 PB 147 328

A study of Centaurus-A/NGC 5128 at 960 Mc/s shows that the radio extensions are visible in the decimeter wavelength range as well as at meter wavelengths. A comparison of the results at 960 Mc/s and 85 Mc/s shows that the brightness distributions are very similar, thus the spectrum of the radio emission is independent of the region of emission. The brightness distribution can be clearly separated into at least three components, a central source and two extended sources. The two extended sources resemble the two source distribution of Cygnus-A determined from interferometry. (Author)

Radio Observatory, Calif. Inst. of Tech., Owens Valley.
OBSERVATIONS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY RADIO OBSERVATORY, 1960. 1. RADIO SOURCE MEASUREMENTS AT 960 MC/S, by D. C. Harris and J. A. Roberts. Rept. on Contract Nonr-220(19). [1960] 25p. 14 refs. AD-236 747.
Order from LC mi$2.70, ph$4.80 PB 147 322

A study was made of 106 radio sources, using one of the equatorially mounted 90-ft paraboloids of the Owens Valley Radio Observatory. This investigation was made at a frequency of 960 Mc. The primary result of the study is a reliable catalog of sources which will be used as a 'finding list' for precise position measurements which are currently being undertaken with the two antennas operating as an interferometer. In addition, the results provided valuable information on the spectra of the sources, and were also used in a search for optical counterparts to the sources. (Author)

Radio Observatory, Calif. Inst. of Tech., Owens Valley.
OBSERVATIONS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY RADIO OBSERVATORY, 1960. 2. A SURVEY OF GALACTIC RADIATION AT 960 MC/S, by R. W. Wilson and J. G. Bolton. Rept. on Contract Nonr-220(19). [1960] 24p. 10 refs. AD-236 750.
Order from LC mi$2.70, ph$4.80 PB 147 326

Observations were made of galactic radiation at a frequency of 960 Mc/s with an antenna of 0.8 beamwidth over a range of 300° in galactic longitude. The beamwidth used is comparable to that used by Hill, Slee and Mills (Aust. J. Phys. 11:530, 1958) at 85 Mc/S, and by Westerhout (B. A. N. 14:215, 1958) at 1390 Mc/s. The present survey has considerably greater coverage than either of these and sufficient overlap to permit a reasonable study of the variation in brightness distribution with frequency. The observations are presented as a series of contour maps on equal area charts. Data is given on the 110 discrete sources observed, including their position, flux density, angular size and, where possible, spectrum and identification. (Author)

Radio Observatory, Calif. Inst. of Tech., Owens Valley.
OBSERVATIONS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY RADIO OBSERVATORY, 1960. 3. SELF-ABSORPTION IN THE 21-CM RADIATION FROM GALACTIC NEUTRAL HYDROGEN, by V. Radhakrishnan. Rept. on Contract Nonr-220(19). [1960] 8p. 7 refs. AD-236 752.
Order from LC mi$1.80, ph$1.80 PB 147 327

Self-absorption of 21-cm radiation by a 'cool' cloud was detected near IC 443. An upper limit to the temperature of the cool dense cloud is put at 60°K. (Author)

Radio Observatory, Calif. Inst. of Tech., Owens Valley.
OBSERVATIONS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY RADIO OBSERVATORY, 1960. 4. POLARIZATION AND ANGULAR EXTENT OF THE 960 MC/S RADIATION FROM JUPITER, by V. Radhakrishnan and J. A. Roberts. Rept. on Contract Nonr-220(19). [1960] 4p. 6 refs. AD-236 753.
Order from LC mi$1.80, ph$1.80 PB 147 329

BEHAVIORAL SCIENCES

Human Engineering

Armed Forces-NRC Vision Committee, Washington, D. C.
INFORMATION REQUIREMENTS FOR THE CONTROL OF COMBAT FORCES. SUMMARY OF THE PROCEEDINGS OF A CONFERENCE SPONSORED BY WORKING GROUP VI: VISUAL DISPLAYS HELD AT THE NATIONAL ACADEMY OF SCIENCES, WASHINGTON, D. C. JUNE 24-26, 1959, ed. by J. W. Gebhard and R. M. Hanes. Rept. on Contract Nonr-2300(05). Mar 60, 33p. 1 ref. AD-234 060.
Order from LC mi$3.00, ph$6.30 PB 153 755

Dynamic Analysis Control Lab., Mass. Inst. of Tech., Cambridge.
MEASUREMENT OF HUMAN OPERATOR ALERTNESS IN CONTINUOUS CONTROL SYSTEMS, by Peter Briggs. Rept. on Contract AF 19(604)4548. Apr 60, 35p. Rept. no. 8055-2; ERD-TN-60-794; AD-246 429.
Order from LC mi$3.00, ph$6.30 PB 153 202

The human operator is often assigned continuous visual tracking tasks which demand a high degree of precision during a prolonged period of time. It is common experience that over the course of such a task the human is prone to boredom, fatigue, drowsiness, etc., and as a result his performance is degraded. It is the objective of the present report to evaluate one method for measuring the alertness of a human with the expectation that such a technique might be applied to the monitoring of critical human control tasks so as to anticipate serious performance decrements. The proposed technique is this: while the human operator is tracking a continuously varying reference input, a relatively high frequency, low amplitude disturbance is intermittently introduced at a point between the operator and the process he is controlling; it is thus necessary for the operator to cancel the disturbance by appropriate manipulation of the control elements. His amplitude-phase response to the disturbance input is taken as an alertness measure. The results of laboratory tests on subjects performing a simulated vehicular control task indicate that over the course of a one hour run statistically significant decrements in the alertness may be discerned by this technique. However, additional data are required to fully evaluate the feasibility of the method for application in an alertness monitoring device. (Author)

Personnel and Training

Air Crew Equipment Lab., Naval Air Material Center, Philadelphia, Pa.
COMPILATION OF ANTHROPOMETRIC MEASURES ON U. S. NAVY PILOTS, by Edmund C. Gifford. 28 July 60, 24p. 2 refs. NAMC-ACEL-437; TED NAM AE-1404, Part 1.
Order from LC mi$2.70, ph$4.80 PB 153 489

One thousand one hundred ninety Navy pilots were measured with respect to 25 different morphological features. Of these pilots, approximately 450 were from fighter squadrons, 450 from attack squadrons, and 290 were from other types of squadrons. Percentiles and frequency distribution are presented as well as cross correlation coefficients among the 25 variables. (Author)

Bureau of Naval Personnel, Washington, D. C.
PERSONALITY TEST FAKING: THE EXPRESSED WILLINGNESS OF COLLEGE MEN TO FAKE ON A PERSONALITY TEST, by Bernard Rimland. Aug 60, 11p. 2 refs. Technical Bulletin 60-13; AD-248 141.
Order from LC mi$2.40, ph$3.30 PB 153 604

Due to the importance of personality as a critical determinant of effective performance by naval personnel, new tests and techniques are being devised in an attempt to provide accurate measures of personality traits. One problem faced by research workers in this field and by operating personnel who must use the results of personality tests, is the control and detection of persons who deliberately give false answers on such tests. This report is a by-product of a larger study designed to produce a fake-resistant personality test. It is based on the answers given by a group of students when asked directly whether or not they would have faked on the test if it had been given operationally. Only a small percentage of the students admitted that they would have engaged in extensive falsification, though many said they would have biased their answers to some extent. This finding was the same whether the students signed their papers or responded anonymously. Secondary findings indicated that the students' answers had been influenced, presumably without their awareness or intent, by the instructions they had been given during the earlier experimental administration of the test. (Author)

Bureau of Naval Personnel, Washington, D. C.
THE TRAINING AND UTILIZATION OF SONARMEN ASSIGNED TO CRUISER-DESTROYER FORCE UNITED STATES PACIFIC FLEET, by Edward J. Pickering and Adolph V. Anderson. Sep 60, 50p. 3 refs. Technical Bulletin 60-11; AD-248 140.
Order from LC mi$3.30, ph$7.80 PB 153 561

During the period from March through July 1959, one hundred and thirty-four sonarmen on twenty-six randomly selected Pacific Fleet destroyers were interviewed in order to obtain information about their training and utilization. In general, it was found that the destroyer sonarman is adequately trained by the sonar school to perform the duties to which he is assigned; however, it was noted that the school graduate is not as well prepared to maintain sonar equipment as he is to operate that equipment. Suggestions are made for using the survey results when planning modifications to sonar school training; for taking steps to insure school graduates are thoroughly familiar with electronic test equipment; for providing guide lines for shipboard maintenance training programs; and for orienting sonar school training around the specific equipments the sonarman will operate in the Fleet. (Author)

Clifton Corp., Washington, D. C.
STAFFING REQUIREMENTS FOR CVA-59 CLASS SHIPS, by C. Thomas Clifton. Rept. on Contract Nonr-2476(00). May 60, 137p. 10 refs. AD-238 995.
Order from LC mi$6.90, ph$21.30 PB 148 555

In studying the utilization of naval personnel and in determining personnel requirements two independent studies--one employing a management analysis approach, the other a work measurement diary--were undertaken aboard three ships of the CVA-59 Class. Each of the approaches employed in this study provides valuable staffing data and establishes a data-gathering method which can be utilized by naval personnel with only a minimum of additional training. The Staffing Guides, derived as a product of management analysis, will be useful to manpower planners in developing complements and allowances, to Type and Ship Commands in distributing and allocating personnel, and to researchers in further study of personnel staffing problems. This conclusion is supported by the differences found between actual work requirements figures generated by the contractor and the average of authorized allowances for the CVA-59 Class of ships, as well as between requirements totals and on-board counts for two of the ships studied. The management analysis

approach is a practical and feasible method for obtaining reliable and valid data, as a basis for determining personnel requirements. The diary method is useful in developing personnel requirements; it provides reliable and stable workload data, and such data can be obtained in a relatively short period of time. Study of the relationship between the management analysis and diary approaches gives support to Staffing Guide recommendations, and provides assurance that the guidelines may be used with confidence. (Author)

Human Resources Research Office, George Washington U., Washington, D. C.
SOME PROBLEMS IN PREDICTING TRAINING REQUIREMENTS FOR FUTURE WEAPON SYSTEMS, by Robert A. Goldbeck and Emanuel Kay (American Inst. for Research). Rept. on Contract DA 49-106-qm-1. Nov 60, 32p. 36 refs. Research rept. no. 6.
Order from LC mi$3.00, ph$6.30 PB 153 288

This study includes: (1) A review and summary of several earlier AIR studies concerned with prediction of job and training requirements, delineating problem areas for which solutions must be found if a complete and systematic procedure for predicting the training requirements of future weapon systems is to be developed; (2) an attempt to develop training requirements information for a specific missile system (Hawk) just prior to development of a complete prototype, listing sources of information available at this stage and assessing their relevance in predicting future training needs. Administrative arrangements needed with system-development agencies to facilitate effective predictions of human factor requirements are discussed. (Author)

Personnel Research Board, Ohio State U. Research Foundation, Columbus.
PATTERNS OF LEADER BEHAVIOR: A FACTORIAL STUDY OF NAVY OFFICER PERFORMANCE, by Ralph M. Stogdill, Robert J. Wherry, and William E. Jaynes. Rept. on Studies in Naval Leadership, Contract N6ori-17, T.O. 3. 1953, 90p. 14 refs. AD-13 911.
Order from LC mi$4.80, ph$13.80 PB 154 836

This report released for sale to the public 17 Mar 61.

Empirical tests were used to study the following hypotheses: (I) Leadership behavior is multidimensional; its dimensions are finite in number. (II) The pattern of behavior along the different dimensions is affected by the position to which the leader is assigned. (III) The pattern of behavior along different dimensions is affected by the type of organization. Test measurements and sociometric data were obtained for each of 120 STO's (Specialty by Type of Organization) by combining the scores for all officers of the same specialty in the same type of organization. The 120 STO's represent 47 organizations of 12 types (plus a combined group), 45 billets, and 470 officers. A factor analysis of the correlations among the 120 STO's yielded 8 independent dimensions among the officer activities: public relations representatives, professional consultants, personnel administrators, technical supervisors, schedule-procedure makers, maintenance administrators, decision makers, and coordinators. A marked tendency was noted for similar specialties to appear with high loadings on the same factor. Similarities were revealed among different specialties in the same type of organization, and in other cases among different specialties in the same echelon of organization. The scores of those specialties with the highest loadings on a particular factor indicate that each factor isolates a distinctive pattern of performance. Many of the specialties show high loadings on more than one factor.

Personnel Research Board, Ohio State Research Foundation, Columbus.
THE PREDICTION OF NAVY OFFICER PERFORMANCE, by Ralph M. Stogdill, Ellis L. Scott and others. Rept. on Studies in Naval Leadership, Contract N6ori-17, T.O. 3. 1953, 80p. 1 ref. AD-18 814.
Order from LC mi$4.50, ph$12.30 PB 154 837

This report released for sale to the public 16 Mar 61.

This research was designed to predict the behavior of Navy officers who were transferred to new positions. The objectives were to determine which aspects of administrative performance can be predicted most successfully, which types of transfers can be predicted most successfully, which predictive methods are most successful, and what factors are involved in successful prediction. Data were accumulated on predicting individual items of behavior and the behavior of different subjects. The predictors used the clinical and statistical methods in making their predictions.

Personnel Research Board, Ohio State U. Research Foundation, Columbus.
A STUDY OF LEADERSHIP AMONG SUBMARINE OFFICERS, by Donald T. Campbell. Rept. on Studies in Naval Leadership, Contract N6ori-17, T.O. 3. 1953, 217p. 56 refs. AD-13 890.
Order from LC mi$9.60, ph$33.30 PB 154 838

This report released for sale to the public 16 Mar 61.

Data were collected from 68 officers and 600 enlisted men comprising the crew of 10 submarines in one squadron. The following factors were considered in the study of leadership: the definition and criterion of leadership, setting of the research, naval records of ship efficiency, ship morale, leadership correlations, naval records evaluating individual officers, reputational measures and secondary criteria of officer leadership, administrative performance variables, leader behavior description, sociometric variables, and estimates of group opinion.

Purdue Research Foundation, Lafayette, Ind.
A COMPARISON OF THREE TYPES OF WORK ACTIVITY STATEMENTS IN TERMS OF THE CONSISTENCY OF JOB INFORMATION REPORTED BY INCUMBENTS, by E. J. McCormick and Keith B. Tombrink. Rept. on Contract AF 41(657)240. Aug 60, 79p. 5 refs. WADD-TR-60-80; AD-248 386.
Order from LC mi$4.50, ph$12.30 PB 153 855

Three types of work activity statements (tasks, elements, and work actions) were compared for consistency of job information collected through their use in check lists. Check lists of activities of two maintenance position types were administered to incumbents and supervisors. These provided for reporting job information on seven scales: (1) frequency of performance of activities; (2) time required for performance; (3) mental difficulty; (4) physical difficulty; (5) type of training received; (6) type of training desired; and (7) type of assistance obtained. Three indexes of rater consistency were used: (a) test-retest reliability of scale responses; (b) test-retest reliability of reports about the occurrence of activities; and (c) inter-rater consistency of scale responses. For the quantitative scales, (1-4) tasks and elements yielded more consistent information than work actions. With the qualitative scales (5-7), work actions were more consistent than tasks, with elements falling between and not differing significantly from either of them. (Author)

Purdue Research Foundation, Lafayette, Ind.
DEVELOPMENT OF WORKER ACTIVITY CHECK LISTS FOR USE IN OCCUPATIONAL ANALYSIS, by E. J. McCormick and H. L. Ammerman. Rept. on Contract AF 41(657)237. July 60, 92p. 6 refs. WADD-TR-60-77; AD-248 385.
Order from LC mi$5.40, ph$15.30 PB 153 854

To determine the consistency with which job incumbents respond to a list of task activities, several forms of check lists were completed by job incumbents in three Air Force position types. An identical form was readministered one week later. Consistency was measured by test-retest correlation of scale responses and by the proportion of tasks marked consistently on both administrations. Consistency in reporting frequency of task performance and length of task time was fairly satisfactory with mean reliabilities around .70. Those for relative proportion of total time per task and for general task difficulty were considerably lower (.53 and .52). From analyses of variance, it was determined that: (a) consistency in reporting task occurrence is not generally related to consistency in reporting other types of task information; (b) a recall period of six months elicits more reliable task occurrence information than a one-month period, but the one-month recall yields greater consistency of time and difficulty judgments than the six-month period; and (c) interactions among experimental factors (scales, recall periods, position and equipment types, methods of response) were generally negligible. The degree of reliability shown and the absence of important interactions are evidence that the check list may prove a useful procedure for gathering information over a large variety of conditions and jobs. (Author)

Psychology

American Inst. for Research, Pittsburgh, Pa.
PROMPTED PLUS UNPROMPTED TRIALS VERSUS PROMPTED TRIALS ALONE IN PAIRED-ASSOCIATE LEARNING, by David Angell and Arthur A. Lumsdaine. Rept. on Contract AF 49(638)681. Oct 60, 22p. 12 refs. Research rept. AIR-314-60-IR-129; AFOSR-TN-60-808.
Order from LC mi$2.70, ph$4.80 PB 153 497

An experiment is reported which was concerned with the use of a partial degree of prompting as compared with complete prompting. The basic comparison was between two groups, one of which received prompting on all trials in learning a set of paired associates, and one of which practiced responding without prompting on every fourth trial. The paired-associate learning materials and the intra-trial stimulus-response time intervals were substantially the same as those employed by Cook (1958). The results showed that, contrary to the interpretation of previous data by other investigators, learning was significantly more efficient under the experimental condition of incomplete prompting (prompting on three-fourths of the trials) than under conditions of complete prompting (prompting on every trial). (Author)

Amherst Coll., Mass.
MEASURING ELEMENTS OF NEED ACHIEVEMENT, by Robert C. Birney, Harvey Burdick, and Richard C. Teevan (Smith Coll.) Annual rept. for Sep 58-Sep 59 on Contract Nonr-2309(02). [Feb 60] 13p. 2 refs.
Order from LC mi$2.40, ph$3.30 PB 153 150

A thematic scoring system indicative of a fear of failure is being developed. Data were gathered under 4 conditions: (1) a group testing session during a regular laboratory period; (2) individual performance on the dart task (3) filling out the Habar-Alpert test anxiety questionnaire outside the laboratory; and (4) answering the level of aspiration items immediately before the final examination in the course. The following patterns were derived: (1) negative-average expected D below the midpoint of score and norm; (2) low positive cautious -- average expected D just above score-norm midpoint, pleased D below or equal to the expected D; (3) low positive optimistic -- same as 2 but pleased D is above expected D; (4) high positive cautious -- average expected D is well above score-norm point but pleased D lies between score and expected D; and (5) high positive optimistic -- same as 4 but pleased D lies above expected D. Results showed the relation of need achievement to the groupings created by use of the pleased D score to designate pessimism-optimism. The t value for the difference between the pessimistic and optimistic groups is 1.65, $P < .10$, 36 df. Data further showed that need affiliation is most characteristic of the negative group on expected D score, the difference from the low positive group yielding a t of 1.40, $P < .20$. Comparison of the pessimistic-optimistic groups yields a t value of 2.66, $P < .01$. The negative group departs from the optimistics at the $P < .001$ level.

Applied Mathematics and Statistics Labs., Stanford U., Calif.
THE USE OF MODELS IN EXPERIMENTAL PSYCHOLOGY, by Richard C. Atkinson. Technical rept. no. 28 on Contract Nonr-225(17). 24 May 60, 17p. 9 refs. AD-237 829.
Order from LC mi$2.40, ph$3.30 PB 148 169

A formal analysis of the function of models in psychology is considered. A simple model of behavior is described, and the method of application to a complex problem in decision making is illustrated. By examination of this particular case, the role of mathematical models will be indicated in determining programs of psychological research and specifying the types of empirical observations to be made. (Author)

Dikewood Corp., Albuquerque, N. Mex.
INFORMATION CONTENT OF LEARNED MESSAGES, by L. Wayne Davis and Bennett L. Basore. Rept. on Contract AF 30(602)1890. 28 May 59, 58p. 27 refs. QR-3-1004; RADC-TN-59-209; AD-217 682.
Order from LC mi$3.60, ph$9.30 PB 150 904

The primary purpose of this study was to investigate the application of communication-theory techniques to the theory of learning. A search of the existing literature revealed a dearth of material in the field; therefore, it was necessary to initiate a new effort. Encouraging results were obtained in the direction of measuring the information content of learned messages and were applied to the learning of "binary mosaics" or simple message patterns. (Author)

Duke U. Medical Center, Durham, N. C.
PSYCHOPHYSIOLOGICAL MECHANISMS OF STRESS RESPONSIVITY, by Stanford I. Cohen, Albert J. Silverman, and B. M. Shmavonian. Semiannual rept. for Apr-Oct 60 on Contract AF 49(638)354. [1960] 28p. AFOSR-TN-60-1178.
Order from LC mi$2.70, ph$4.80 PB 152 837

The responses of "field" and "body" orientated subjects toward sensory deprivation were recorded. Individuals were designated "field" or "body" orientated by the Draw a Person Test or the Rod and Frame Test. Subjects were tested for touch threshold and pain tolerance before and after sensory deprivation. The subjects were left in a dark soundproofed room for 2 hr without instruction, during which time, EEG, skin resistance, peripheral plethysmographic, respiratory and cardiac rate records were obtained. Individuals who relied more on field (external) cues, revealed less ability to discriminate sensory cues, remained more aroused, moved around more, appeared more uncomfortable, struggled more with feelings and fantasies or denied them, were more suspicious, projected internal percepts more, and showed a greater degree of disorganization. Individual differences reflected in body/field perceptual dimensions may reflect neurohumoral (nonadrenaline) and physiologic differences or differences in the central nervous system between the two groups, as well as in the response to the environment. Preliminary studies were made of the relationship of sex to the body/field perceptual dimensions.

Fels Group Dynamics Center, U. of Delaware, Newark.
SOME SOCIAL FACTORS AFFECTING THE CHOICE OF AN "IMITATIVE" RESPONSE IN A PROBABILITY LEARNING SITUATION, by John T. Lanzetta and Vera T. Kanareff. Rept. on Psychological Research on Human Performance, Contract AF 33(616)5845. Aug 60, 52p. 26 refs. WADD Technical rept. no. 60-196; AD-249 042.
Order from OTS $1.50 PB 171 545

Seven studies are reported concerning the frequency of occurrence of an imitative response in a two-choice probability learning situation as a function of the characteristics of the task and the choices ostensibly made by a partner. On each trial the subject had the option of either agreeing or disagreeing with a "partner's" response (which was actually controlled by the experimenter). Over trials one of these modes of behavior would maximize the probability of success. In addition several methods were used to induce attitudinal sets concerning the legitimacy of the imitative behavior. Results of the studies tend to support predictions deduced from a modified decision theory framework. The extent of utilization of an imitative response is a positive function of its instrumental value and the amount of reward obtained. The effects of the attitudinal sets, however, appear to depend on the experimental procedures employed. Possible reasons for the inconsistent results and the relevancy of the experiments to the problem of social learning are discussed. (Author)

Langley Porter Neuropsychiatric Inst., San Francisco, Calif.
RELATIONSHIP BETWEEN ALPHA PHASES AND REACTION TIME, by Enoch Callaway III, Charles L. Yeager, and Pat Compton. Annual technical rept. on Contract Nonr-2931(00). 18 May 60, 10p. 11 refs. AD-237 757.
Order from LC mi$1.80, ph$1.80 PB 147 561

A method was presented for studying the relationship between brain potentials and behavior that allows a statistically reliable demonstration of a slight increase in simple reaction time when the stimulus is presented at a particular alpha phase. It would appear from this study that during an alpha cycle of .01 second, there is a period of approximately 10 milliseconds during which reaction times are slowed by approximately 10 milliseconds. (Author)

Louisiana State U. [Baton Rouge]
CONFORMITY, DEVIATION, AND A GENERAL THEORY OF INTERPERSONAL BEHAVIOR, by Bernard M. Bass. Technical rept. no. 20 on Behavior in Groups, Contract N7onr-35609. Mar 60, 59p. 133 refs. AD-233 293.
Order from LC mi$3.60, ph$9.30 PB 153 760

Conformity has been conceived as the reflection of successful influence. This conception makes it possible to apply a general theory of interpersonal behavior in order to derive a series of theorems accounting for much of what is known about conformity and deviation as well as providing hypotheses about conforming behavior for which no experimental evidence yet exists. (Author)

Michigan U. [Ann Arbor].
FACTORS IN RESISTANCE TO ATTITUDE CHANGE. I. PERSONALITY FACTORS, by Helen Peak, H. William Morrison and others. Technical rept. no. 1 [on Contract Nonr-1224(10)]. 15 Aug 56, 54p. AD-123 629.
Order from LC mi$3.60, ph$9.30 PB 154 866

This report released for sale to the public 17 Mar 61.

Hypotheses and results are presented regarding the following variables: (1) The influence of attitude of ex-

perimentally induced pressure to change in different directions (2) The relation of personality measures and initial attitude (3) The relation of personality factors and susceptibility to attitude change.

New York U., N. Y.
THE VARIABLES AND CONDITIONS OF SMALL GROUP INTERACTION, by Edgar F. Borgatta (Cornell U.). Final rept. for 1 Sep 57-8 Oct 60 on Contract AF 49(638)195. [1960] 16p. 17 refs. AFOSR-TR-60-165; AD-248 453.
Order from LC mi$2.40, ph$3.30 PB 153 080

This project explores the scope and inclusiveness of variables relevant to the understanding of individual and group behavior in small group interaction. Brief summaries are given on studies bearing on the description of individual behavior, the exploration of additional aspects of personality, the inducibility of changes in personality, and the structure variables in small groups.

Personnel Research Board, Ohio State U. Research Foundation, Columbus.
MOTIVATIONAL FACTORS IN INDIVIDUAL AND GROUP PRODUCTIVITY. IV. THE EFFECTS OF PERSONAL AND SITUATIONAL MOTIVATION UPON INDIVIDUAL PERFORMANCE IN A SMALL-GROUP SETTING, by William B. Pavlik. Rept. on Contract N6ori-17, T. O. 3. 1956. 76p. 50 refs. AD-115 143.
Order from LC mi$4.50, ph$12.30 PB 154 835

This report released for sale to the public 16 Mar 61.

The focus of attention is upon the interactive effects of personal and situational motivation upon the performance of individuals in a group situation. Situational motivation is varied through the use of a monetary incentive and the frequency of interpolated time signals; personal motivation or "individual drive level" is inferred from scores on the Taylor Scale of Manifest Anxiety; and individual performance is defined by scores on an assembly task performed in a small-group setting. (Author)

Small Groups Research Center, Washington U., St. Louis, Mo.
STATUS VARIABLES AND MATCHING BEHAVIOR, by Richard deCharms and Milton E. Rosenbaum. Technical rept. no. 2 on Contract Nonr-816(11). May 60, 18p. 14 refs. AD-237 641.
Order from LC mi$2.40, ph$3.30 PB 147 767

Seven-two subjects (Ss) participated in a conformity experiment where matching behavior was the dependent measure. Although evidence indicated the efficacy of manipulation of the independent variables of status and revocability of status, they were not found to be directly related to matching behavior. The S's self-esteem was found to be related to matching in two independent samples. There was tentative evidence that revocability of high status may augment matching behavior in comparison with other conditions, and that telling a high self-esteem person that he has low status may decrease his matching behavior. (Author)

Small Groups Research Center, Washington U., St. Louis, Mo.
VARIATIONS IN INTERACTION PROFILES AND GROUP SIZE, by Robert L. Hamblin and Keith Miller. Technical rept. no. 3 on Contract Nonr-816(11). May 60, 19p. 13 refs. AD-237 642.
Order from LC mi$2.40, ph$3.30 PB 147 768

An attempt was made to determine how and to what extent interaction profiles are influenced by the size of the interacting group. The data consisted of 27 interaction profiles, each of which was a summary or the average of the amount of interaction of the individuals in several groups of a given size. A matrix of correlation coefficients for the 12 interaction categories and group size was calculated and then factor analyzed using the principal axis method and an oblimax rotation. Two factors were importantly related to group size. Factor II, interpreted as an Asch effect, was correlated with group size .63. Giving agreement was positively loaded on the factor, whereas giving orientations, and showing tension were negatively loaded. Group size was more highly correlated with a third factor--.74. Three of the interaction variables were significantly loaded on this factor, indicating that giving and asking for evaluations decrease as group size increases, and giving orientations increases. The suggestion is that as group size increases, the tendency for the group to become centralized into factions increases. When this happens, the factions tend to develop their own representatives who, in the process of representing the faction, abandon attempts to communicate insightful opinions and evaluations as well as other idiosyncratic content, and tend to utilize orientations which are based on more objective data. Thus, the tendency is for interaction to become more objective and less subjective as group size increases. (Author)

Washington State U., Pullman.
STUDIES OF SHORT TERM RETENTION: 1. RECALL OF UNRELATED ITEMS IN A SEQUENTIAL TASK, by Kenneth E. Lloyd. Rept. on Contract AF 49(638)805. June 60, 15p. 6 refs. Research rept. WSU-1; AFOSR-TN-60-1057; AD-247 385.
Order from LC mi$2.40, ph$3.30 PB 153 403

Short term retention was studied in a situation requiring subjects to remember familiar letter-word pairs until their recall was requested. During the time the subjects were required to remember these items they were presented other items or asked to recall previously presented items. A measure of the average number of items being remembered at the time of a requested recall was investigated as an independent variable. Subjects listened to tape recorded sequences of the letter-word pairs. When they heard a letter alone they were instructed to recall all words previously paired with that letter. The average number of letter-word pairs that the subjects were required to remember varied from 2.5 to 12.5. Recall errors were found to increase systematically with an increase in the average number of items the subjects were remembering. These results show high agreement with previous studies of short term retention in this sequential task. This independent variable, termed average storage load, has now been shown to be related to recall errors over a wide range of its values, for related and unrelated items, and under conditions

where subjects recall one or several items at each recall point. Average storage load may provide a means of scoring, or ordering, operational tasks that require storage of information for short periods of time. (Author)

Washington U., Seattle. Div. of Counseling and Testing Services.
COMPARABILITY OF FACTOR STRUCTURE OF PERSONALITY ITEMS UNDER VARIED INSTRUCTIONS, by Max L. Hillmer, Jr. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C5). May 60, 90p. 13 refs.
Order from LC mi$4.80, ph$13.80 PB 148 610

A method of demonstrating the common factor structure of three or more data matrices developed by Horst was applied to a set of personality items administered with three different sets of instructions. The principal axis factors underlying each of the three forms of the questionnaire were determined and the resulting factor loading matrices were rotated by an analytic method so that the corresponding factors from each subtest were maximally correlated and the noncorresponding factor correlations were minimized. Six common factors were established. Applications of this method to situations where several measurement techniques are used on a single group or a single technique is used on several groups were indicated. (Author)

BIOLOGICAL SCIENCES

[Defense Atomic Support Agency] Washington, D. C.
THE RESIDUAL RADIOLOGICAL HAZARD FROM THE AIR DETONATION OF AN ATOMIC WEAPON IN THE RAIN, by L. D. Gates, T. A. Gibson, Jr. and others. May 53, declassified 15 Sep 59, 46p. AFSWP-501(Del).
Order from LC mi$3.30, ph$7.80 PB 154 402

This report released for sale to the public 2 Mar 61.

The residual radiological hazard which might result from the use of an atomic weapon air burst during a continuous rain situation was investigated. This required a consideration of atomic cloud heights and dimensions in rainy weather, of radioactive decay, of the scrubbing action by rain and other precipitation which brings radioactive debris to the ground, of the altitudes of precipitation levels, of the times required for the radioactive material to reach the earth, and of the reduction in the residual radiation due to shielding by surface features. A mathematical method taking these factors into account was devised to calculate dosage and dose rate. Calculations were made for yields from 1 to 14 KT. It is concluded that this estimation of the hazard is sufficiently reliable for operational planning and that a full-scale atomic test in rain is not necessary to verify the magnitude and extent of the hazard. (Author)

Sperling Labs., Arlington, Va.
DIPROPARGYL ETHER: 1,6 HEPTADIYNE. Summary rept. on Contract Nonr-2727(00). [1960] 45p. AD-230 814.
Order from LC mi$3.30, ph$7.80 PB 152 902

Dipropargyl ether produced liver damage after both oral administration and after exposure to vapors. The possibility of such damage resulting from repeated exposures to low levels should be considered. Dipropargyl ether produced gastrointestinal damage following inhalation of vapors. Similar damage was produced by 1,6 heptadiyne after oral administration to dogs; 1,6 heptadiyne produced severe hypotension after both oral administration and after inhalation of vapors. This was seen in the presence of chicken-fat clots in the heart and in the difficulty of obtaining peripheral blood after exposure. Dipropargyl ether also caused some instances of this. Both compounds produced lung congestion and hyperemia after both oral administration and exposure to vapors. Both compounds are potent central depressants at all concentrations studied. Both compounds induce profound anorexia after both oral administration and inhalation of vapors. Both compounds induce headaches and nausea in humans breathing low concentrations even though they are not aware of the nature of the compound. This was noted when the odor from opened bottles were detected at a distance of a few hundred feet. Both compounds change with time. This change reduces the toxicity. This is especially true of 1,6 heptadiyne. (Author)

Syracuse U., N. Y.
CONTROL OF WOOD-ROTTING FUNGI, by M. W. Jennison, Francis Milazzo, and Alexander Perritt. Rept. no. 10 (Final) 1 Oct 57-31 Dec 59 on Contract Nonr-669(06). Feb 60, 22p. 8 refs. AD-232 662.
Order from LC mi$2.70, ph$4.80 PB 153 122

Seven species of terrestrial wood-rotting Basidiomycetes utilized, in a synthetic medium, only the L- (natural) form of two common amino acids--alanine and aspartic acid. The D- (unnatural) form was not utilized in any instance. Eleven species of terrestial wood-rotting Basidiomycetes grew in a synthetic medium with thiamine as the only vitamin; with a mixture of the thiamine moieties, thiazole and pyrimidine; and with thiazole alone. None of the organisms grew in one chemical type of pyrimidine, while 3 species did grow in another type. One organism grew well in neopyrithiamine, a thiamine antimetabolite. All but 2 of the species tested were able to use the thiazole moiety of penicillin. Biotin could not be substituted for thiamine in any case. A simple synthetic medium was developed for the growth of 7 species of non-basidiomycetous marine fungi. Nine polysaccharides were isolated from a simple synthetic medium in which 4 species of terrestrial wood-rotting Basidiomycetes were cultured in 3 separate carbon sources. The polysaccharides were purified, and qualitatively characterized by a variety of procedures. The polysaccharides were found to be qualitatively identical; all were 1-4-linked, unbranched glucans. Two contained beta configurations, the others contained alpha configuations. (Author)

Aeronautical Research Lab., Air Force Research Div., Wright-Patterson AFB, Ohio.
PARACHUTIST'S SPIN PROBLEM, by Otto Walchner and Frank Sawyer. Rept. for Mar-Sep 58 on Aerodynamics of High Drag Bodies. Dec 60, 8p. ARL Technical note 60-150.
Order from OTS $0.50 PB 171 048

The purpose of this research was to estimate the spinrates possible when a man falls free from high altitudes in a supine position. The spinning moments acting on a small model in a uniform airflow were determined for some configuration which were slightly unsymmetrical with respect to the spinaxis. The spinrates were then calculated assuming that the body does not pitch and roll during the fall. For a vertical fall from an altitude of 83,000 feet, spinrates were determined which far exceed the value which may be fatal to man. (Author)

California Inst. of Tech., Pasadena.
THE MECHANISM OF THE HYPERACTIVITY AND PROLONGED ANOXIC SURVIVAL OF SPINAL REFLEXES IN CORDS WHICH HAVE RECOVERED FROM ASPHYXIATION, by A. van Harreveld. Annual progress rept. for June 59-Apr 60 on Contract Nonr-220(34). 25 Apr 60, 5p. 1 ref. AD-235 755.
Order from LC mi$1.80, ph$1.80 PB 154 099

Following recovery from asphyxiation of the spinal cord for periods of 30-35 min the remaining reflex activity consists mainly of an exaggerated extensor tone. This reflex activity will survive renewed asphyxiation for unusually long periods (up to about 15 min.). An attempt is being made to elucidate the mechanisms underlying these changes in the reflex behaviour of the cord. (Author)

Naval Research Lab., Washington, D. C.
PHOTOMETRY AT LOW LEVELS OF INTENSITY, by L. H. Dawson and E. F. DuPre'. Interim rept. 12 Jan 61, 64p. 25 refs. NRL rept. 5530.
Order from OTS $1.75 PB 161 834

In an attempt to clarify the problems involved in the field of physical and visual photometry, and to give some helpful suggestions concerning their solutions, it is desirable to review and summarize the principles of photometry, colorimetry, and the physiology of the eye. Several instruments and methods were developed to help in solving the problems in this field. Step-by-step descriptions for the calibration of instruments, and the measurement of luminances of low-level sources are given in order to point out appropriate precautionary steps. The spectral sensitivity curve of the eye shifts toward the region of shorter wavelengths for sources at low-intensity light levels and the eye then becomes many times more sensitive. Thus, measurements of the intensity and color of a source, using visual photometric techniques, are strongly influenced by these characteristics of the eye. Also, the angular subtense of the source at the retina of the eye determines the eye's ability to distinguish small differences in source brightness. This results from the physiological makeup of the cone and rod structure of the retina. Special procedures must then be developed and instruments designed to take these effects into account. Physical photometry is related to visual comparison of a physically measured quantity with the characteristics of a standard source of radiation as seen in a calibrated photometer. This comparison depends strongly upon whether it is made in the photopic, mesopic, or scotopic region of vision.

Ohio State U., Columbus, Ohio.
NONLINEAR PASSIVE MECHANICAL PROPERTIES OF SKELETAL MUSCLE, by N. A. Coulter, Jr. and J. C. West. Rept. on Research on Physics and Chemistry of Neurosensory Processes, Contract AF 33(616)5780. Aug 60, 11p. 3 refs. WADD Technical rept. 60-636.
Order from OTS $0.50 PB 171 495

The nonlinear, passive mechanical properties of skeletal muscle were investigated. The response of frog gastrocnemius muscle to sinusoidal displacements over a frequency band of 0.5 to 25 cps was determined From the experimental data a nonlinear differential equation characterizing the passive mechanical behavior of muscle was constructed. (Author)

School of Aviation Medicine [Brooks AFB] Tex.
EFFECTS OF OXYGEN AND DECOMPRESSION ON SALIVA, by David F. Mitchell. 11 June 45, 8p. 1 ref. Proj. no. 392, rept. 1; AD-139 670.
Order from LC mi$1.80, ph$1.80 PB 154 426

This report released for sale to the public 7 Mar 61.

There were no demonstrable differences between the test and control groups in the 4 factors under consideration, namely, pH, volume, Lactobacillus acidophilus counts and apparent gingival condition.

School of Aviation Medicine, Brooks AFB, Tex.
THE PHYSIOLOGICAL EFFECTS OF HYPODYNAMICS INDUCED BY WATER IMMERSION, by Duane E. Graveline and Bruno Balke. Sep 60, 12p. 6 refs. Rept. 60-88; AD-247 163.
Order from LC mi$2.40, ph$3.30 PB 153 402

Body immersion in water was used to produce an experimental situation in which the normal weight sensation was altered and in which slow movements were effortless. The hypodynamic effects of such immersion on orthostatic tolerance, on cardiorespiratory adaptability to physical stress, and on other biologic and psychophysiologic parameters were studied on one human subject in experiments of 2 and 7 days' duration, respectively. Pronounced functional deterioration resulted from the hypodynamic situation in both experiments; cardiovascular reflexes were severely disturbed and muscular tone was diminished. The extensive biochemical studies on blood and urine showed marked deviations from the normal. Psychomotor effectiveness, tested on a complex systems task, was impaired noticeably. The need for sleep appeared to be markedly reduced during the periods of water immersion. (Author)

School of Aviation Medicine [Brooks AFB] Tex.
REFERENCE CURVES FOR ALVEOLAR COMPOSITION AND ARTERIAL OXYGEN SATURATION AT VARIOUS ALTITUDES, by John S. Gray. 15 July 44, 16p. 14 refs. Project rept. no. 290, rept. no. 1; AD-106 522.
Order from LC mi$2.40, ph$3.30 PB 154 819

This report released for sale to the public 17 Mar 61.

On the basis of 1156 alveolar samples reported in the literature, a reference curve has been constructed showing the average composition of alveolar air at various altitudes from sea level to 22,000 feet. On the basis of more than 500 determinations of arterial oxygen saturation, reported in the literature, a reference curve has been constructed showing the average arterial oxygen saturation at various altitudes from sea level to 22,000 feet. (Author)

School of Aviation Medicine, Brooks AFB, Tex.
A SIMPLE AND RAPID POLAROGRAPHIC METHOD FOR BLOOD OXYGEN DETERMINATION, by James R. Neville. Sep 59, 11p. 11 refs. Rept. 60-3; AD-231 545.
Order from LC mi$2.40, ph$3.30 PB 153 583

A simple, rapid polarographic method for determining oxygen content of blood is discussed in detail. The method is shown to give results comparable to those obtained by the Van Slyke manometric analysis. The technic can be quickly learned and requires only a nominal degree of skill. The catalaselike effects of methemoglobin and other blood derivatives is shown to have a quantitative influence on the oxygen current obtained with the dropping mercury electrode at the plateau of the oxygen wave. The oxygen current at the plateau of the hydrogen peroxide wave is found to be independent of the concentration of such substances. This effect, which is to be distinguished from that produced by whole blood, is discussed with reference to other proposed polarographic methods for determining blood oxygen content. (Author)

Stanford U. School of Medicine, Calif.
A THERMODYNAMIC ANALYSIS OF THE ADSORPTION OF ANTIBODIES TO NORMAL GUINEA PIG TISSUE, by George A. Feigen. Annual interim progress rept. for 1959-1960 on A Study of "Immediate" Sensitization by Adsorption of Antigens and Antibodies, In Vitro", Contract Nonr-225(46). 1 May 60, 26p. 31 refs, AD-239 177.
Order from LC mi$2.70, ph$4.80 PB 148 931

Experiments dealing with the effects of sex and strain upon the adaptation of rats to an altitude of 12,500 feet were carried out. Fourteen primary variables were measured on each rat to determine the changes occasioned by the stress upon the blood picture, serum protein and electrolytes, and the electrolyte pattern of the heart. The energetics of the binding of antibodies to strips of normal guinea pig ileum were studied by the methods of classical kinetics and thermodynamics, using the magnitude of the Schultz-Dale response as a measure of the amount of antibody bound to the tissue.

Biochemistry

Brooke Army Medical Center, Fort Sam Houston, Tex.
METABOLISM OF BURNED PATIENTS. II. AN ESTIMATION OF POTASSIUM REQUIREMENTS FOR EQUILIBRIUM, by Elinor Pearson, Harry S. Soroff and others. Final rept. on Radiation and Thermal Burns. Aug 60, 31p. 7 refs. Research rept. MEDEW-RS-4-60. AD-247 336
Order from LC mi$3.00, ph$6.30 PB 153 405

Potassium balances were measured in eleven burned patients during four ten-day periods. The periods represented the acute catabolic phase, the late catabolic phase, the anabolic phase, and the late convalescent phase. The intake furnished 3,500 calories per square meter. Eleven normal controls were observed on an intake identical to that of the patients. The patients stored increasing amounts of potassium during the successive periods, but the controls showed more positive balances than the patients during Period 4. Potassium and nitrogen were stored in a ratio larger than the protoplasmic ratio in 10 of the 11 patients. Regression lines of the potassium balances on the intake showed that the requirements for equilibrium decreased as the postburn course progressed. The requirement of the controls agreed closely with that of the patients during Period 4. The ratio of the x-intercepts of the potassium and nitrogen regression lines suggests that during Periods 1, 2, and 3 a K:N ratio of 6:1 in the intake will result in the most efficient utilization of the elements at equilibrium. A ratio of 4:1 in the intake was required by the patients during Period 4 and by the controls. (Author)

Brooks Army Medical Center, Fort Sam Houston, Tex.
METABOLISM OF BURNED PATIENTS. III. AN ANALYSIS OF ALTERATIONS IN BODY COMPOSITION, by Harry S. Soroff, Elinor Pearson and others. Final rept. on Radiation and Thermal Burns. Oct 60, 31p. 5 refs. Research rept. MEDEW-RS-5-60.
Order from LC mi$3.00, ph$6.30 PB 153 406

Eleven male burned patients were studied for four ten-day periods representing the acute catabolic phase, the late catabolic phase, the anabolic phase, and the late convalescent phase. Among the information accumulated were nitrogen, potassium, and sodium balances and daily weights. Theoretical weight curves calculated from the three balances were compared with the observed weight curves. The patients of Plan I stored fat and protein during Periods 2 and 4 and were catabolizing fat in the presence of lean tissue gain during Period 3. Presumable the caloric intake was inadequate during this period of active protein synthesis, and additional calories were obtained from the endogenous fat stores. The order of the administration of the high nitrogen intake had an apparent influence on the changes in fat storage of the patients in Plan II. When the low nitrogen intake was given first, it was accompanied by a higher carbohydrate intake, and fat was stored throughout the period. But, when the low nitrogen intake was given last, fat was lost during the entire period. This phenomenon was most striking for Pair 1. It is suggested that during certain

periods of the postburn course, anabolism of protein has priority and stored fat may be utilized to further protein synthesis and storage. (Author)

Naval Missile and Astronautics Center, Point Mugu, Calif.
STUDY OF ULTRAVIOLET ABSORPTION SPECTRA OF DEOXYNUCLEOSIDES AND POLYNUCLEOTIDES IN RELATION TO THE GENERAL PHENOMENON ENTITLED "THE HYPOCHROMIC EFFECT", by W. C. Gillchriest. 15 Nov 60, 8p. 7 refs. Technical memo. no. NMC-TM-60-56.
Order from LC mi$1.80, ph$1.80 PB 153 355

Experimental evidence was gathered in a study of the "hypochromic effect" at the mononucleoside, nucleotide, and oligonucleotide levels of molecular organization. The ultraviolet-absorption spectrum of a mixture of nucleotides equivalent in number to the nucleotides in an organized polynucleotide did not demonstrate the "hypochromic effect." Therefore, at least two conclusions may be drawn: (1) That the "hypochromic effect" is the result of sequence of the nucleotides in a given cluster (oligonucleotide) in the polynucleotide, and (2) that the "hypochromic effect" is the result of the magnitude of or the number of nucleotides in the cluster. The experimental evidence demonstrated an absence of the "hypochromic effect" and consequently an apparent absence of change in molecular orbital organization. It is clear that the molecular orbital organization is not due to what is contemporarily called "hydrogen bonding." Further studies with a specifically designed calorimeter should produce data that can be coupled with the ultraviolet-absorption data to clarify the mechanics of the "hypochromic" phenomenon in nucleic acid structure. (Author)

Medical Specialties and Equipment

Indiana U. School of Medicine, Indianapolis.
A METHOD OF PHOTOGRAPHING FLUORESCENCE IN CIRCULATING BLOOD OF THE HUMAN EYE, by H. R. Novotny and D. L. Alvis. Sep 60, 5p. 2 refs. Rept. 60-82; AD-247 162.
Order from LC mi$1.80, ph$1.80 PB 153 401

The development of methods for measuring change in the caliber of retinal vessels (1) and for estimating the retinal arteriovenous blood oxygen difference (2) has made it possible to evaluate, to some degree, the direction in which retinal blood flow may change in response to various stimuli, and the PO_2 at which the oxygen requirement of the retina is being satisfied. These means of estimating changes and adequacy of retinal blood flow are indirect. A more direct means of observing retinal blood flow would provide more precise information about variations in the retinal circulation under different conditions. The purpose of this report is to describe some preliminary observations on the use of intravenous fluorescein and retinal photography to study retinal blood flow. (Author)

Ohio State U. Research Foundation, Columbus.
RESEARCH ON THE PRODUCTION OF CLINICAL RADIOGRAPHS BY MEANS OF COMPACT, LOW-ENERGY AND HIGH-INTENSITY RADIOACTIVE SOURCES, by H. D. Spangenberg and M. L. Pool. Annual technical rept. no. 2, 1 Jan-31 Dec 59, on Contract Nonr-495(17). 4 Jan 60, 59p. 35 refs. AD-233 093.
Order from LC mi$3.60, ph$9.30 PB 152 865

Roentgenograms with the best diagnostic characteristics are shown to be produced by either a 65 kv machine operated at 70 kv or by a 90 kv machine operated at 90 kv when their beams are filtered by Cu and Al. Such roentgenograms possess less over-all contrast and may be psychologically less pleasing, but provide a greater amount of information. The Victoreen R Meter indicates that less radiation is required to produce a diagnostic roentgenogram when a filtered beam is used. Of the 3 filter configurations 0.375 mm of Cu and 0.5 mm of Al proved the best. The spectral analysis by the scintillation spectrometer indicates that the reduction in dosage occurs as a result of the elimination of much of the low-energy part of the white radiations emitted by the dental x-ray machines. If the x-ray beam is unfiltered by added external filtration or is filtered by a 0.5 mm Al added filtration, the radiation dosage required to produce equivalent roentgenographic film density is less when the radiations from a 90 kv machine are used in place of the radiations from a 65 kv machine operated at 70 kv. Under these filter conditions, it would seem that the inclusion of a 90 kv machine in the diagnostic armamentariums of the general practitioner of dentistry is fully indicated. (Author)

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
COMPUTER TECHNIQUES FOR THE STUDY OF PATTERNS IN THE ELECTROENCEPHALOGRAM, by B. G. Farley, W. A. Clark, Jr. and others. Rept. on Contracts DA 36-039-sc-64637 and AF 19(122)458. 6 Nov 57, 21p. 7 refs. Technical rept. no. 337; Lincoln Lab. Technical rept. no. 165; AD-110 027.
Order from LC mi$2.70, ph$4.80 PB 150 607

A process has been explored, using the Lincoln TX-0 computer, for detecting patterns in the electroencephalogram and for recognizing the characteristics of the EEG corresponding to individual subjects. Preliminary results indicate that a number of different subjects and states of the same subject can be distinguished with excellent probability. (Author)

Pathology

Arctic Aeromedical Lab., Ladd AFB, Alaska.
EFFECT OF HYPOTHERMIA ON THE CELLULAR RESPIRATION OF VENTRICULAR TISSUE, by John P. Hannon and Benjamin G. Covino. Mar 58, 13p. 20 refs. Technical rept. 57-40.
Order from LC mi$2.40, ph$3.30 PB 153 374

The respiration of ventricular slices and homogenates in the presence of various substrates was studied in control normothermic and experimental hypothermic rats. The QO_2 of the slices prepared from rats cooled to a rectal temperature of 15° C. was significantly higher than that of control normothermic animals. No difference in the rate of oxidation of ventricular homogenates was observed between the two groups except when no substrate was used or when pyruvate was added as the test substrate. In the absence of substrate there was a tendency toward higher rates in the hypothermic group, whereas addition of pyruvate caused a significant depression in the oxygen consumption of this group. Addition of malate to the pyruvate containing medium produced a marked increase in respiratory rate. The data obtained indicate that hypothermia does not have any adverse irreversible effect on the function of the tricarboxylic acid cycle and its associated enzyme systems. The results do suggest a possible alteration in membrane permeability, an accumulation of reduced intracellular intermediates, or both, as a result of the hypothermic episode. (Author)

Arctic Aeromedical Lab., Ladd AFB, Alaska.
GLYCINE AS AN ANTIFIBRILLARY AGENT IN HYPOTHERMIA, by William R. Beavers and Benjamin G. Covino. Mar 58, 11p. 11 refs. Technical rept. 57-29.
Order from LC mi$2.40, ph$3.30 PB 153 370

In both accidental and surgical hypothermia, the chief hazard to life is the occurrence of ventricular fibrillation. Glycine, an amino acid, has been used to inhibit cyclopropane-epinephrine induced arrhythmias, and this compound was evaluated in the prevention of arrhythmias due to lowered body temperatures. Mongrel dogs were used; pH, blood pressure, electrocardiograms, plasma potassium, and blood sugar were determined at frequent intervals during cooling. Control animals, receiving no medication were cooled to terminus and the incidence of ventricular fibrillation was 96%. A second group receiving glycine, 1.5 to 2.0 gm./kg., was cooled to terminus, and the incidence of fibrillation was reduced to 0%. In animals cooled to a reduced temperature of 24° C. and subjected to a right thoracotomy, right ventriculotomy, and 10 minutes' venous occlusion, the incidence of ventricular fibrillation was 93%; the frequency of fibrillation in glycine treated animals during hypothermic cardiac surgery was 29%. Glycine treated animals exhibited significantly higher blood sugar and plasma potassium levels during hypothermia. The most likely explanation of the antiarrhythmic effect of glycine in hypothermia appears to be its ability to increase plasma potassium concentration. (Author)

Brooke Army Medical Center, Fort Sam Houston, Tex.
MEASUREMENT OF THE MOUSE PROTECTIVE EFFECT OF ANTIBODY FOR PSEUDOMONAS AERUGINOSA IN BURNED AND UNBURNED PATIENTS' SERA, by Charles D. Graber, Dan Cummings and others. Interim rept. on Radiation and Thermal Burns, Proj. no. 6X59-06-001. Oct 60, 12p. 9 refs. MEDEW-RS-7-60.
Order from LC mi$2.40, ph$3.30 PB 153 640

Native hemagglutinin to a pseudomonad polysaccharide (PC-9) present in the sera of burned and non-burned patients was shown to have little protective function for mice injected with a highly virulent nosocomial Pseudomonas aeruginosa phage type. Study of sequential sera of a single burned patient surviving long enough to produce hyperimmune antibody to his pseudomonad septicemia suggests that immune bacterial agglutinin and immune hemagglutinin are protective. Hyperimmune sera from an unburned rabbit further substantiated this relationship. (Author)

Brooke Army Medical Center, Fort Sam Houston, Tex.
METABOLISM OF BURNED PATIENTS. I. AN ESTIMATION OF THE NITROGEN REQUIREMENTS FOR EQUILIBRIUM, by Harry S. Soroff, Elinor Pearson and Curtis P. Artz. Final rept. on Radiation and Thermal Burns. May 60, 41p. 29 refs. Research. rept. MEDEW-RS-2-60; AD-246 506.
Order from LC mi$3.30, ph$7.80 PB 153 191

Nitrogen requirements for equilibrium in burned patients were estimated by two plans of study in which the nitrogen intake ranged from 1.0 to 28.8 gm per square meter and the total calories remained constant at 3,500. The two experimental designs were such that the balance data could be subjected to regression analysis. Eleven male patients between the ages of 18 and 33 were studied for four ten-day periods. The periods represented the acute catabolic phase, the late catabolic phase, the anabolic phase, and the late convalescent phase. The patients studied had a burn index ranging from 20 to 35. Eleven normal controls were studied for a ten-day period. The amounts of nitrogen per square meter per day estimated to be necessary for equilibrium during the four phases ranged from 20.7 to 25.5 gm, 13.1 to 16.4 gm, 3.3 to 9.3 gm, and 3.3 to 7.0 gm, respectively. The nitrogen requirements of the patients during the late convalescent phase were similar to the requirements of the controls. (Author)

Brooke Army Medical Center, Fort Sam Houston, Tex.
MODIFIED EXPOSURE: A NEWER TECHNIQUE IN THE MANAGEMENT OF THE BURNED PATIENT, by Duane L. Larson, Wilfred T. Tumbusch and others. Interim rept. on Radiation and Thermal Burns, Proj. no. 6X59-06-001. Oct 60, 17p. 6 refs. MEDEW-RS-8-60.
Order from LC mi$2.40, ph$3.30 PB 153 641

The exposure method in the management of burn injury is more desirable than is the use of massive, occlusive dressings. In order to eliminate the use of occlusive dressings, even in the grafting phase, the technique which we have called "modified exposure" for grafting has been developed. This is the application of one layer of coarse-mesh paraffinized gauze over the grafted areas; no other dressing is applied. The modified exposure technique has proved extremely useful, and is far superior to the conventional bulky dressing technique. Although it is impossible to say that this procedure has reduced mortality or serious infection, it has contributed materially to the survival of a number of extensively burned patients. (Author)

Cornell U. Medical Coll., New York.
STUDIES ON THERMAL RADIATION, by James D. Hardy. Final rept. on Contract N6-ORI-91, T.O. 10. 1 Sep 52. 15p. 26 refs. ATI-199 919.
Order from LC mi$2.40, ph$3.30 PB 154 803

This report released for sale to the public 17 Mar 61.

Contents:
Studies on thermal radiation in indoor and outdoor environments
Studies on pain sensation evoked by thermal radiation
Studies on temperature sensation evoked by thermal radiation
Measurement of heat loss and heat production in humans and animals at different environmental temperatures
Studies of infrared spectra of biologically important compounds.

New York Medical Coll., N. Y.
ANNUAL PROGRESS REPORT. Rept. on Contracts Nonr-2754(00) and (01). [1959] 10p. AD-231 817.
Order from LC mi$1.80, ph$1.80 PB 153 152

The observations made in a pilot experiment are confirmed. A large number of animals either recover completely or their diabetic conditions improve in the 4 to 8 wk period after being given alloxan. The degree of the diabetic state does not greatly influence the gross appearance of a fetal tissue implant, nor do these factors seem to influence the persistence of the transplanted tissue. The persistence of the graft and its continued growth after the first week are significantly related to the age of the donor. When compared to the controls, it appears that alloxan causes a marked reduction in white blood cells (WBC), while a larger percentage of polys and a smaller percentage of lymphs is maintained. The more severe diabetics have lower hematocrit and hemoglobin values than do the controls. In the high diabetics, the albumin and beta globulin rise while the controls drop in the period following alloxan dosage. Both high and moderate diabetics show a less-marked decline in gamma globulin than do the controls in the same period. After transplantation, both the controls and low diabetics show increases in WBC while the high and moderate diabetics do not show this rise. (Author)

CHEMISTRY

Inorganic Chemistry

Crystallography Lab., U. of Pittsburgh, Pa.
THE POLYHEDRAL CLATHRATE "ICE" STRUCTURES IN HIGH HYDRATES, by G. A. Jeffrey, D. Feil and R. McMullen. Technical note on Contract AF 49(638)456. Oct 60, 22p. 9 refs. AFOSR-TN-60-1479; AD-246 986.
Order from LC mi$2.70, ph$4.80 PB 153 490

Richmond Research Lab., Stauffer Chemical Co., Calif.
INORGANIC POLYMERS PROGRAM, by F. O. Groch, V. Hubbard and others. Semi-annual technical rept. for 1 Jan 59-1 Jan 60 on Contract Nonr-2259(00). 25 Feb 60, 82p. 34 refs. AD-233 515.
Order from LC mi$4.80, ph$13.80 PB 152 875

Inorganic polymers: Tris-trimethylsilylphosphine (I) was synthesized. Ansul-141 ether was added to Na which was dispersed in toluene. PH_3 was then passed with N into the Na dispersion. The $NaPH_2$ produced was added to trimethyl silylchloride; the reaction was allowed to proceed until I was completely evolved. Chemical reactions of I were studied including oxidation with slow diffusion of air, the reactions with B_2H_6, B_5H_{12}-9, $CoCl_2$, diphenyldichlorosilane, and thermal decomposition. The reactions of perhalonitriles with B_2H_6 indicated that with simple nitriles the main product is the expected borazine. The preparation of pentachlorophenylsilanes was investigated. Direct chlorination of phenyl silanes was successful. C-F-N polymers, triazines: Perfluoromalononitrile was prepared. Nitriles and related compounds were prepared from duPont telomer alcohols. The alcohols were converted to the acids, to the esters, amides, and to the nitriles by distillation of the amides with P_2O_5. In preparing amidines the nitrile had to be added to the NH_3 since the reverse addition produced imidines. The structure of perfluoroglutaronitrile-NH_3 addition product was studied by IR and UV absorption. C-F-N polymers, triazoles: The preparation of di-perfluoroalkyleneaminotriazole polymers was studied by 2 methods: (1) pyrolysis of an α,ω-dihydrazide; perfluoroglutaro hydrazide, and (2) pyrolysis of an α,ω-dihydrazidine; perfluoroglutaro hydrazidine. Pyrolysis of perfluorobutyro hydrazine yielded 3,5-diperfluorobutyro-N-aminotriazole and the isomeric 3,6-di-perfluorobutyro-dihydrotetrazine.
Included in this report is:
Fluorination of hexachlorobenzene with antimony pentafluoride, pub. in the Jnl. of Organic Chemistry 24:1132-1133, 1959.
(See also PB 148 594)

Technische Hochschule, Vienna (Austria).
INORGANIC CHLORIDES AND OXYCHLORIDES AS SOLVENTS, by Viktor Gutmann. Annual technical rept. no. 1, 1 Oct 59-30 Sep 60, on Contract DA 91-591-EUC-1252. 87p. 37 refs; AD-246 544.
Order from LC mi$4.80, ph$13.80 PB 152 848

Systematic investigations were carried out on donor- and acceptor-properties of chlorides in solutions of phosphorus oxychloride and phenylphosphonic dichloride. An apparatus was devised for ebullioscopic measurements in hygroscopic and reactive solutions with a high degree of accuracy. Potentiometric and conductometric titrations were examined critically with respect to conclusions on the occurrence of chloride ion transfer reactions. A new spectrophotometric method was worked out to give direct proof for chloride-ion transfer reactions. This method uses the color differences between either $FeCl_3$ and $[FeCl_4]^-$ or WCl_6 and $[WCl_7]^-$. The donor strengths of chlorides and the first chloro-complexes (reciprocal acceptor strength of the chlorides) and the chloride ion activities in the solutions of the pure chlorides in $POCl_3$ were found to decrease. The solubili-

ties were found to decrease with increasing charge of the ions. Some di- and trichlorides may donate all chloride ions, while this is restricted to 1 chloride ion with tetrachlorides. Chlorometallate-ions with an even co-ordination number are unsolvated, but solvated with an uneven co-ordination number. Chloronium ions are usually solvated. Numerous indications were obtained for the existence of chemical association by chlorine bridges in solutions of nonpolar chlorides and the compounds formed from them. Bjerrum's ion association was found to occur in solutions of alkali chlorides, perchlorates and chlorometallates and seems to be of more general occurrence.

Yale U., New Haven, Conn.
DETERMINATION OF THE STANDARD FREE ENERGY OF FORMATION OF LEAD SELENIDE, by Cabell B. Finch and J. Bruce Wagner, Jr. Technical rept. no. 1 on Contract Nonr-609(34). [1960] 7p. 6 refs. AD-237 619.
Order from LC mi$1.80, ph$1.80 PB 147 528

The standard free energy of formation of lead selenide between 200° and 300°C has been determined using a galvanic cell involving a solid electrolyte. The standard free energy of formation may be expressed by $\Delta G^{o} = [-23,352 + 3.8(t-250)]$ cal. (Author)

Organic Chemistry

Institute of Polymer Research, Polytechnic Inst. of Brooklyn, N. Y.
THE ADSORPTION OF POLYDIMETHYL SILOXANES FROM SOLUTION, by Robert Perkel (Doctoral thesis) and Robert Ullman. Technical rept. on Contract Nonr-839(19). 10 May 60, 65p. 20 refs. AD-239 106.
Order from LC mi$3.90, ph$10.80 PB 148 788

Experiments were carried out to analyze the adsorption of the coiling polymer molecules of dissolved polydimethyl siloxanes on the surfaces of glass and iron powder. Polypentamethyl disiloxane methacrylate was also studied. Molecular weights were obtained by viscosity measurements, and infrared spectra were used to analyze the polymer solutions. The general experimental procedure consisted of weighing of pyrex glass powder into an adsorption tube; 10 ml of solution of known concentration was pipetted on top of the powder. Most experiments were performed with a constant weight of adsorbent and varying solution concentration. The tubes were immersed in dry-ice-acetone mixture, sealed, and agitated overnight. The supernatant liquid was transferred to a small flask for IR analysis and subsequent calculation of the specific adsorption. Analysis of isotherms obtained when the amount of adsorbent is constant and the initial polymer concentration of the solution is varied and vice versa revealed the inhibitory action of small amounts of water on adsorption of the polymers. General results of the studies are as follows: (1) polymer adsorption at the liquid-solid interface exceeds that possible in a 2-dimensional layer; (2) adsorption isotherms indicate monolayer formation; (3) polymer adsorption increases with a low power of molecular weight when monolayer coverage is complete; and (4) adsorption from a poor solvent is greater than that from a good one, except where the solvent is strongly adsorbed.

Massachusetts Inst. of Tech., Cambridge.
PREPARATION OF PERFLUOROVINYL-METAL COMPOUNDS, by D. Seyferth, K. A. Brändle, and G. Raab. Technical rept. no. 3 on Contract Nonr-1841(43). 29 Jan 60, 3p. 4 refs. AD-231 951.
Order from LC mi$1.80, ph$1.80 PB 152 877

The following perfluorovinyltin compounds were prepared by the reaction of perfluorovinyl-magnesium bromide in tetrahydrofuran with a series of organotin halides: (1) $(C_2H_5)_3SnCF{=}CF_2$, (2) $(n\text{-}C_4H_9)_3SnCF{=}CF_2$, (3) $(n\text{-}C_4H_9)_2Sn(CF{=}CF_2)_2$, and (4) $(C_6H_5)_3SnCF{=}CF_2$.

Noyes Chemical Lab., U. of Illinois, Urbana.
SPIN DENSITIES IN ORGANIC FREE RADICALS, by Thomas H. Brown, D. H. Anderson, and H. S. Gutowsky. Technical rept. no. 27 on Contract Nonr-1834(13). 2 Mar 60, 23p. 38 refs. AD-234 555.
Order from LC mi$2.70, ph$4.80 PB 153 814

The proton hyperfine constants obtained from proton magnetic resonance spectra of polycrystalline free radicals and from valence bond calculations of π-orbital spin densities are compared for the free radicals α,α'-diphenyl-β-picryl hydrazyl and tris-p-chlorophenylaminium perchlorate. Two lines are observed in the proton magnetic resonance spectra, one shifted upfield and one downfield from the normal resonance frequency. These are assigned to the ortho and para protons, and the meta protons of the free radicals, respectively. Though the agreement between theory and experiment is not quantitative for the hyperfine constants, the theoretical and experimental ratios of hyperfine constants agree within experimental error. This serves to establish the existence of positive and negative spin densities and to verify the signs of some of the relationships involved. (Author)

Pennsylvania State U., University Park.
BOND DISSOCIATION ENERGIES IN SMALL HYDROCARBON MOLECULES (A REVIEW) by Bruce E. Knox and Howard B. Palmer. Rept. on Contract Nonr-1858(25). Mar 60, 26p. 64 refs. Proj. Squid Technical rept. PSU-6-P; AD-235 849.
Order from LC mi$2.70, ph$4.80 PB 153 686

A literature review is presented of the theory and measurement of the dissociation energies of C-H and C-C bonds in simple hydrocarbons. The compounds and bonds discussed are: (1) methane (CH_3-H, C-H, CH_2-H, and CH-H); (2) ethane (CH_3CH_2-H, CH_2CH_2-H, and CH_3-CH_3); (3) ethylene (CH_2CH-H, CHCH-H, and $CH_2{=}CH_2$); and (4) acetylene (C_2H-H, C_2-H, CH CH and C_2).

Textile Research Inst., Princeton, N. J.
THERMAL EXPANSION COEFFICIENTS AND THE STRUCTURES OF POLYMERS, by Alison Sutherland, James H. Wakelin, and Howard J. White, Jr. Technical rept. no. 20 on Contracts Nonr-09000 and Nonr-09001. May 60, 56p. 43 refs. AD-236 670.
Order from LC mi$3.60, ph$9.30 PB 147 170

X-ray diffraction measurements were made of the linear thermal expansion coefficients of high polymers. The changes in the lattice parameters of crystallized material and in the interchain separation of disordered material were noted. Measurements of the angle of the diffracted beam were obtained from X-ray diffractometer traces of patterns from polymer fiber bundles and films at temperatures from -196°C to room temperature. Tabulation of thermal expansion coefficients showed that contraction is first observed at a temperature dependent on the looseness of interchain bonding. It was thought that contraction might be associated with transition to hexagonal packing of the chains, but can apparently result at lower temperatures, before rotational modes are excited. Studies were made of the change in thermal expansion values for the three crystallographic directions with temperature, mechanical strain, and intracrystalline swelling.

University of Southern California, Los Angeles.
NEW APPROACHES TO THE PHOSPHINOBORINE POLYMERS, by Anton B. Burg and Peter J. Slota, Jr. Technical rept. no. 6 on Contract Nonr-228(13) and rept. on Contract AF 33(616)2743. 1 Nov 59, 15p. 17 refs. AD-228 250.
Order from LC mi$2.40, ph$3.30 PB 150 520

The trimer $(Me_2PBH_2)_3$ was made in 52% yield by the reaction of Me_2POCl with $NaBH_4$ in diglyme. The reaction of Et_2PCl with $NaBH_4$ in diglyme gave an air-stable oil appearing to be $(Et_2PBH_2)_3$; and admixed $EtPCl_2$ led to similar material presumed to contain P-H bonds. Thermal decomposition of such material yielded H_2, the ethylphosphines, $(Et_2PBH_2)_3$ and boron-rich residues. The adduct $Me_2NPMe_2 \cdot BH_3$ (m. p. 12°; b. p. est. 211°) decomposed above 160° to give H_2, aminoborines, Me_2PH, $(Me_2PBH_2)_n$ (23%, mostly trimer), the rare biphosphine $P_2(CH_3)_4$ (20%) and non-volatile $[B_3H_5(Me_2P)_2Me_2N]_x$, having soft-plastic character. The solid adduct $Me_2NPMe_2(BH_3)_2$ above 200° gave H_2, Me_2PH, aminoborines $(Me_2PBH_2)_3$ (over 50% yield) and thermoplastic material wherein B atoms outnumbered the basic units at least two to one. The plasticity and high thermal stability of such materials can be explained in terms of a boron-hydride network structure which is rendered opener but less labile by entrapped basic units. (Author)

Physical Chemistry

Aerojet-General Corp., Azusa, Calif.
RESEARCH ON ELECTROCHEMICAL FUEL CELLS, by M. J. Cramer, S. B. Kilner, and E. M. Langworthy. Rept. for 15 Nov 51-10 Aug 56 on Contract N7onr-46207. 24 May 57, declassified. 82p. 13 refs. Rept. no. 1233 (Final); AD-133 949.
Order from LC mi$4.80, ph$13.80 PB 155 002

This report released for sale to the public 16 Mar 61.

The general purpose has been to determine the feasibility of employing primary batteries as the prime propulsion unit of undersea vehicles. A battery of the type developed during the program could be used to power a submarine for a 1 to 2-week cruise at very low noise levels and without the necessity of surfacing to recharge batteries. The zinc-chlorine electrochemical system was selected for intensive development after an initial examination of potentially applicable battery systems. The battery at the present stage of development consists of a continuously fed, gaseous chlorine cathode, and a zinc anode that is installed at time of manufacture. The electrolyte is a recirculated zinc chloride solution in sea water. Auxiliary equipment consists of the tanks, piping, valves, and controls necessary to control the circulation of electrolyte and chlorine to the battery proper. During the exploratory phases of this program, magnesium, aluminum, zinc, many alloys of these metals, and hydrogen were studied as possible anode reactants. Early battery designs were based on a moving-cell system, by which a constant interelectrode spacing was maintained as zinc was consumed by compression of cell stocks. The present program has produced a zinc-chlorine battery of practical design. A specific energy of 1/5 hp-hr/lb is indicated.

Air Force Cambridge Research [Labs.] Bedford, Mass.
A REVIEW OF CHARGE TRANSFER PROCESSES IN GASES, by S. N. Ghosh, W. F. Sheridan and others. July 55, 30p. 48 refs. Geophysical Research Papers no. 48; AFCRC-TR-56-205.
Order from LC mi$2.70, ph$4.80 PB 154 748

This report released for sale to the public 16 Mar 61.

A review is given of the nature and importance of the charge transfer process ($A^+ + B \rightarrow A + B^+$) particularly with regard to its role in certain chemical and physical processes. Experimental techniques for determining the charge transfer cross sections are discussed, with special reference to the recent method whereby the number of ions due to charge transfer is directly compared with that of the primary beam. This technique has been utilized by the authors. The cross sections obtained from experimental data in the energy range 50 - 800 eV are discussed in some detail. The data obtained by other investigators from thermal energies to 40 KeV are also presented. It is shown that the adiabatic theory (Massey) satisfactorily explains the charge transfer reaction for a large number of simple atomic and molecular cases. However, certain very simple cases cannot be explained in terms of this theory even by assuming excited states or dissociation of the molecules by collision. (Author)

Arizona State U., Tempe.
THERMOELECTRIC MATERIALS AND DEVICE RESEARCH, by B. R. Gossick and H. B. Whitehurst. Quarterly progress rept. no. 3, 18 Mar-17 June 60 on Contract DA 36-039-sc-85249. [1960] 11p. 3 refs. AD-243 115.
Order from LC mi$2.40, ph$3.30 PB 153 233

Methods are described which were developed for purification of the precipitated titanium dioxide used in these experiments. The methods of preparing high melting point metals in colloidal form is also described, together with the procedures which were used to mix these particles into a matrix of titanium dioxide. Theoretical consideration of the principles involved in the electrical behavior of two phase systems is reviewed. The work being done on the systems for evaluation of the new materials is reported together with the experiments which were done to establish macroscopic metal to rutile junctions. (Author)

Arkansas U. [Fayetteville].
HIGH TEMPERATURE ELECTROCHEMISTRY, by K. H. Stern. Final rept. on Contract AF 49(638)653. [1960] 18p. 4 refs. AFOSR-TR-60-171; AD-248 496.
Order from LC mi$2.40, ph$3.30 PB 153 827

Research was carried out on: (a) Kinetics of the reaction between metallic silver and fused sodium chloride using both conventional and EMF techniques. (b) Development of a chlorine reference electrode in molten boric oxide medium. (c) Mechanism of the thermal decomposition of potassium perchlorate.

Biophysics Lab., Stanford U., Calif.
PRECISION g-VALUE MEASUREMENTS ON FREE RADICALS OF BIOLOGICAL INTEREST, by M. S. Blois, H. W. Brown, and J. E. Maling. Rept. on Contract AF 18(600)1511. Aug 60, 22p. 11 refs. B. L. rept. no. 11; AFOSR TN-60-716.
Order from LC mi$2.70, ph$4.80 PB 152 961

In previous work [Adams, et al. J. Chem. Physics 28, 774 (1958)], it had been noted that g-values of semiquinones appeared to be different and to depend upon features of molecular structure. Because the interpretation of experimental results when dealing with biological free radicals would seem to lean heavily upon correctly explaining the origin of g-value differences, a systematic study of the g-values of semiquinone-free radicals and hydrocarbon ions was done.

Bureau of Mines, Bartlesville, Okla.
A NEW APPROACH TO THE COMBUSTION CALORIMETRY OF ORGANOSILICON COMPOUNDS. THE HEATS OF COMBUSTION AND FORMATION OF HEXAMETHYLDISILOXANE, by W. D. Good, J. L. Lacina and J. P. McCullough. Technical note on Contract CSO 59-9. Nov 60, 14p. 12 refs. ARPA Order no. 24-59, Task 3; AFOSR-TN-60-1414.
Order from OTS $0.50 PB 171 528

A rotating-bomb method was developed for the precision combustion calorimetry of organosilicon compounds. The standard heat of combustion of hexamethyldisiloxane was determined, and a tentative value of the heat of formation was derived. An experimental method was found that may ultimately lead to improved values of the heat of formation of aqueous fluosilicic acid solutions. More reliable values of the heats of combustion and formation of benzotrifluoride were determined. (Author)

Bureau of Mines, Pittsburgh, Pa.
THE PROCESS OF IGNITION BY HOT GASES, by M. Vanpée, A. E. Bruszak, and H. G. Wolfhard. Rept. on Contract Nonr-1858(25). Mar 60, 37p. 9 refs. Proj. Squid Technical rept. BUM-29-P.
Order from LC mi$3.00, ph$6.30 PB 153 687

A detailed study of the process of ignition of explosive mixtures by contact with hot gases is presented. The ignition is produced by a laminar jet of hot nitrogen issuing into a cold explosive mixture of carbon monoxide and air. The ignition may be quenched by a cool plate placed in the path of the jet, a few centimeters upstream of the normal point of ignition. A complete exploration of the velocity, temperature and composition field is made in the jet, which is luminous. The results indicate that: (1) in all the regions considered the flow lines are vertical, with some divergence at the edge of the jet; (2) the temperature and velocity in the center of the jet remain practically constant; and (3) the luminous region is a region of combustion with low fuel concentration and with the point of maximum reaction lying well within the hot jet and moving further toward the center with increasing height. A method is proposed for the determination of specific reaction rates. The method is based on the application of the heat equation (in its differential form) in the central part of the jet where the temperature of the jet remains constant with height. In this region all the heat produced by chemical reaction is conducted away in the radial direction and therefore the determination of reaction rates requires only the measurement of the first and second derivatives of the temperature profile in the vicinity of the center of the jet. (Author)

California U., Berkeley.
THE LIGHT-INDUCED cis-trans ISOMERIZATION OF NITROUS ACID FORMED BY PHOTOLYSIS OF HYDRAZOIC ACID AND OXYGEN IN SOLID NITROGEN, by John D. Baldeschwieler and George C. Pimentel. Rept. on Contract AF 49(638)1. 31 Aug 60, 30p. 20 refs. AFOSR TN-60-1018; AD-246 358.
Order from LC mi$2.70, ph$4.80 PB 153 051

Photolysis of hydrazoic acid in solid nitrogen at 20° K with oxygen present yields both cis- and trans-nitrous acid. The identification is based on infrared detection of features of the isotopically substituted species HONO, DONO, and $HO^{18}NO^{18}$. The nitrous acid probably results from the reaction of imidogen with oxygen: $NH + O_2 = HONO$. Isomerization of nitrous acid occurs in the matrix at 20°K under the influence of irradiation. Ultraviolet radiation causes the trans- to cis-reaction, probably by electronic excitation to give a random mixture of the two forms. Near infrared radiation reverses the reaction but the role of the radiation is not known. Bulk heating of the sample is not involved and a broad range of near infrared frequencies is effective. No isomerization of DONO could be detected and $HO^{18}NO^{18}$ seemed to isomerize more slowly than did HONO. (Author)

California U., Berkeley.
THE NITRIC OXIDE-FLUORINE DILUTE DIFFUSION FLAME, by Donald Rapp and Harold S. Johnston. Final rept. on Contract Nonr-222(56). 10 Mar 60, 20p. 19 refs. AD-233 516.
Order from LC mi$2.40, ph$3.30 PB 153 764

The dilute diffusion flame method for measuring the rates of fast gas reactions were used to study the reaction: $2NO + F_2 = 2ONF$. The reaction proceeded with the emission of visible light, and photographic methods were used to obtain concentration profiles in space. With a reasonable assignment of rate constants for succeeding steps, it is shown that the experimentally measured rate constant can be interpreted as the rate constant for the first step in this mechanism. The rate constant was determined at room temperature and at dry-ice temperature, and is given by: $K = 6 \times 10^{11} \exp(-1500/RT)$ cc/mol-sec. The probable error in the activation is estimated to be 1000 calories, so that the activation energy for this reaction is limited to the range 500 to 2500 calories. Calculation of the theoretical pre-exponential factor showed the direct one-step termolecular reaction to be too slow by many orders of magnitude to account for the observed rate constant. It is estimated that significant quantities of fluorine atoms are produced in this system, and the radiative lifetime of ONF^* is approximately 10 msec.

California U. [Berkeley].
PROCEEDINGS OF CONTRACTOR'S MEETING ON AIRBREATHING COMBUSTION [NO. 4]. Rept. on Contract AF 49(638)166. Oct 60, 18p. AFOSR-TN-60-1253; AD-247 033.
Order from LC mi$2.40, ph$3.30 PB 153 448

Contents:
Development of detonation
Combustion in the vicinity of a hypervelocity missile
Standing detonation wave
Recent results on standing detonation waves
Supersonic combustion, by W. Koffer
Supersonic combustion, by G. Dugger
Pinch induced chemical reactions
Investigation of screeching combustion and pressure-wave flamefront interaction
Natural convection above open fires
Theoretical research in combustion aerodynamics
Interactions among burning fuel droplets and their effects on combustion stability and roughness
Properties of ions in flames
Thermal decomposition and related reactions of organometallic compounds

Chemical Engineering Lab., Princeton U., N. J.
SURFACE RECOMBINATION OF HYDROGEN ATOMS IN THE PRESENCE OF WATER VAPOR, by E. J. Nowak, S. Kurzius and others. Rept. on Contract AF 49(638)32. [1960] 19p. 10 refs. AFOSR-TN-60-1302; AD-247 517.
Order from OTS $0.50 PB 171 512

The probability γ of recombination of hydrogen atoms on Pyrex glass has been measured between 390 and 460°C. The data are represented by the expression $\gamma = 2.6 \cdot 10^{-2} \exp(-E/RT)$ where E = 9 kcal/g-mole. The measurements were made in the presence of water vapor. These rates of recombination are slower by more than three orders of magnitude than corresponding rates on Pyrex in the absence of water vapor. There results demonstrate unequivocally for the first time that water vapor poisons glass walls for the recombination of hydrogen atoms. (Author)

Florida U. Engineering and Industrial Experiment Station, Gainesville.
FLUOROCARBON NF COMPOUNDS, by J. A. Young and R. D. Dresdner. Quarterly technical rept. no. 5, 1 July-30 Sep 60, on Contract DA 01-009-ORD-772. [1960] 7p. ARPA Order no. 40-59, Task no. 3.
Order from LC mi$1.80, ph$1.80 PB 152 403

At least one representative of a new class of fluorocarbon compounds has been synthesized, the reaction between CF_3COCl and the mercury derivative of N,N'-bis (trifluoroacetyl) hydrazine giving a good yield of $(CF_3CO)_4N_2$. N-Acetylperfluoroglutarimide, $CF_2(CF_2CO)_2NCOCF_3$, may also have been obtained. Attempted alkylation of an N-bromoamide by use of a fluoroalkyl mercurial failed, a fluorocarbon bromide being formed by combination of the positive bromine with the fluoroalkyl group. Several fluorocarbon iminosulfur difluorides, $R_FN=SF_2$, have been made for fluorination studies. First results indicate that their reaction with AgF_2 is surprisingly slow and that no NF compounds were obtained. (Author)

Frick Chemical Lab., Princeton U., N. J.
THE INFRARED SPECTRUM AND FORCE FIELD OF CRYSTALLINE HYDROGEN PEROXIDE, by R. L. Miller (Doctoral thesis, Brown U.) and D. F. Hornig. Technical rept. no. 4 on Contract Nonr-1858(27). 15 Apr 60, 26p. 26 refs. AD-235 769.
Order from LC mi$2.70, ph$4.80 PB 154 109

The infrared spectrum of crystalline and vitreous hydrogen peroxide was studied from 300 cm^{-1} to 4000 cm^{-1}. A normal coordinate analysis of the tetragonal crystal with four molecules per unit cell is given. The hydrogen bonds are only slightly weaker than in H_2O but the O-H line widths are only 80 cm^{-1}. From the coupled motion of the torsion and the high frequency libration, the torsional frequency in the gas is estimated to be about 230 cm^{-1}. (Author)

Fulmer Research Inst., Ltd. (Gt. Brit.).
MEASUREMENTS OF THE HEATS OF FORMATION OF INORGANIC FLUORIDES ESPECIALLY THE ELEMENTS OF ATOMIC NUMBER BELOW 20, by P. Gross, C. Hayman and others. Final technical rept. for 1 Nov 59-31 Oct 60 on Contract DA 91-591-EUC-1316. 23 Nov 60, 32p. 12 refs. R. 146/4; AD-247 281.
Order from LC mi$3.00, ph$6.30 PB 153 445

The heats of formation of phosphorus pentafluoride and boron trifluoride were determined calorimetrically by combustion of the elements in fluorine at 25°C. In the case of boron, preliminary experiments indicated that spontaneous burning of the fluorine did not take place at room temperature. A small quantity of sulphur which ignites spontaneously in fluorine was therefore used to initiate the reaction. Extensive studies have

also been made towards establishing a suitable experimental method for the combustion of beryllium in fluorine under conditions which can be applied in calorimetric measurements of the heat of reaction. (Author)

Gates and Crellin Labs. of Chemistry, Calif. Inst. of Tech., Pasadena.
SMALL-RING COMPOUNDS. XXVIII. ISOTOPE-POSITION REARRANGEMENTS OF ALLYLCARBINYL GRIGNARD REAGENTS, by Marc S. Silver, Paul R. Shafer and others. Technical rept. no. 8 on Contract Nonr-220(26). Mar 60, 6p. 3 refs. AD-235 340.
Order from LC mi$1.80, ph$1.80 PB 153 812

Presented in part at the Sixteenth National Organic Symposium, Seattle, Washington, June 15, 1959.

Gates and Crellin Labs. of Chemistry, Calif. Inst. of Tech., Pasadena.
SOME IODINE ATOM RECOMBINATION RATES BY FLASH PHOTOLYSIS, by Rolf Engleman, Jr. and Norman R. Davidson. Rept. on Contract [Nonr-220(01)]. [1959] 22p. 16 refs.
Order from LC mi$2.70, ph$4.80 PB 152 102

The rate constants of the homogeneous gas-phase iodine atom recombination have been measured by flash photolysis in the presence of several third body gases. Hydrogen, helium, benzene, and methyl iodide have been studied as third body gases at several temperatures between 323 and 548°K., and their third order rate constants are $1.41 \times 10^9 (298/T)^{0.80}$, $4.93 \times 10^9 (298/T)^{1.48}$, $1.00 \times 10^{11} (298/T)^{2.53}$, and $1.50 \times 10^{11} (298/T)^{3.24}$ liters^2 moles^{-2} seconds^{-1}, respectively. Ethyl iodide, hydrogen iodide, and carbon monoxide were used at 323°K. and yielded 2.38×10^{11}, 2.81×10^{10}, and 5.42×10^9 liters^2 moles^{-2} seconds^{-1}, respectively. Limited experiments were made with nitric oxide as a third body gas. The recombination rate was apparently too fast to measure with this apparatus, but an apparent lower limit of 1.8×10^{13} liters^2 moles^{-2} seconds^{-1} was established. (Author)

Hebrew U. (Israel).
THE RADIATION CHEMISTRY OF CHLOROFORM SYSTEMS, by Gabriel Stein, M. Ottolenghi and I. Eliezer. Rept. for Jan-Dec 59 on The Chemistry and Physics of Materials, Contract AF 61(052)224. Sep 60, 25p. 8 refs. WADD Technical rept. 60-668.
Order from OTS $0.75 PB 171 497

A dosimeter based on solutions of biallyl in chloroform is developed. The radiation chemistry of pure H_2O and O_2 free chloroform is investigated and all products identified. A reaction mechanism is derived. (Author)

Hughes Aircraft Co., Culver City, Calif.
RESEARCH ON HIGH TEMPERATURE POLYMERS, by J. B. Rust, C. L. Segal, and H. H. Takimoto. Technical rept. no. 3, 1 Mar-1 Sep 59, on Contract Nonr 2540(00). [1959] 123p. 30 refs. AD-235 020.
Order from OTS $2.75 PB 171 522

Syntheses and characterizations were conducted on: (1) poly(triorganometalloxy)metalloxane polymers, and (2) poly(chelated)metalloxane polymers. A large batch of a poly(trimethylsiloxy)titanoxane polymer was prepared which is soluble in polar solvents dimethylformamide and MeOH, and non-polar solvents benzene, toluene, and CCl_4. The molecular weight was determined from light scattering measurements of the polymer in CCl_4 solution to be 26,000. Films of the polymer were prepared by evaporation of solvent or fusion of the solid resin. Synthesis of the triphenylsiloxymetalloxane polymer was approached by the isolation of bis(triphenylsiloxy)dialkoxy derivatives of Ti, in which the alkoxy groups were either pentoxy, heptoxy, benzyloxy, or phenoxy, in addition to the isopropoxy derivative. Reaction of bis(triphenylsiloxy)diisopropoxytitanium with diphenyldiacetoxysilane resulted in a fusible, soluble polymer, from whose melt a fiber could be drawn. Syntheses of polymers with a quartz-like structure were also conducted. The chelated metalloxanes, with maximum coordination number internally satisfied, were prepared by the alkoxyacyloxy reaction of the corresponding di- or tri-chelated derivatives of Ti or by their controlled hydrolysis.

Illinois U., Urbana.
SELF-DIFFUSION OF THE CHLORIDE ION IN SODIUM CHLORIDE, by Neal Laurance. Technical rept. no. 4 on Physics of the Solid State, Contract Nonr-1834(19). Jan 60, 51p. 43 refs; AD-231 346.
Order from LC mi$3.60, ph$9.30 PB 152 884

The self-diffusion coefficient of the chlorine ion has been measured in pure sodium chloride crystals and in sodium chloride crystals doped with calcium chloride. The measured diffusion coefficient can be expressed as $D = 56.6 \exp(-2.12 \text{ ev/kt})$ between 520°C and 740°C for pure sodium chloride, and $D = 1280 \exp(-2.49 \text{ ev/kT})$ between 585°C and 730°C for sodium chloride crystals containing 0.05 mole % calcium. The units of D are cm^2/sec. The diffusion coefficient of chlorine has been measured at constant temperature as a function of calcium concentration. The results are not expressible by a simple relation, but they indicate that the diffusion coefficient is lower in crystals containing calcium than in pure crystals by a factor of from 5 to 10, and that the diffusion coefficient is insensitive to the magnitude of the calcium concentration. It is concluded that the motion of free negative ion vacancies, while adequate to explain the observed diffusion coefficient in the case of pure crystals, fails to explain the observed dependence of the diffusion coefficient on calcium concentration. The motion of vacancy pairs is examined as a mechanism for diffusion, and it is concluded that unless the theoretical treatment of the vacancy pair has been grossly inadequate the observed temperature dependence of the diffusion coefficient of chlorine in both pure and doped crystals precludes the motion of vacancy pairs as a possible mechanism of diffusion. The details of the penetration of the isotope into the crystal exclude any effects due to dislocations lines which are long compared to the penetration distance. (Author)

Illinois U. Engineering Experiment Station, Urbana.
THERMOELECTRIC PROPERTIES OF MAGNESIUM TITANATES, by Stuart Maurice Myron. Thesis. Technical note on Contract AF 49(638)212. 10 Nov 60, 69p. 6 refs. AFOSR-TN-60-1188; AD-248 554.
Order from LC mi$3.90, ph$10.80 PB 153 836

Sintered disc-shaped samples of three magnesium titanates were partially reduced by heat treatment in hydrogen. The values of electrical resistivity, thermoelectric coefficients, and donor concentration were determined in dependence both of degree of reduction and of temperature. Linear, logarithmic relations were established between these quantities. Moderately large thermoelectric coefficients were found but the correlated electrical resistivities were too high for technical applications of these materials for power generation or for refrigeration. (Author)

Istituto di Fisica Superiore, Universita di Pavia (Italy).
RECENT RESULTS ON NUCLEAR MAGNETIC RELAXATION, by G. Bonera, L. Chiodi and others. Final technical rept. for Mar 59-Feb 60 on Contract DA 91-591-EUC-1058. Feb 60, 39p. 6 refs; AD-234 910.
Order from LC mi$3.00, ph$6.30 PB 150 063

Theoretical work was conducted on an adiabatic passages picture in nuclear magnetic resonance with the rotating coordinate method. Experimental work was concerned with the comparison between the longitudinal and transversal relaxation time in some pure liquids. Results recently obtained with nuclear relaxation in colloidal solutions are reported. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
ALUMINUM HYDRIDE: A LITERATURE REVIEW, by C. J. Hoffman. Technical note on Chemistry. Aug 60, 21p. 31 refs. LMSD-703150; AD-244 583.
Order from OTS $0.75 PB 171 534

The existing unclassified literature pertaining to aluminum hydride has been reviewed. Methods of preparation, the physical and the chemical properties are discussed. A number of thermodynamic values have been estimated for the monomeric form of aluminum hydride. (Author)

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
MOLECULAR FRAGMENTS IN SHOCK WAVES, by R. Stephen Berry. Final rept. on Contract AF 49(638)538. Aug 60, 35p. 24 refs. 02878-1-F; AFOSR-TR-60-118; AD-244 842.
Order from LC mi$3.00, ph$6.30 PB 152 612

The following work is described: (1) the design of an apparatus used for absorption spectroscopy of materials behind shock fronts, with provision for multiple-pass optics; (2) preliminary results based on shocks through alkali halides, giving evidence of dissociation and formation of diatomic alkali metal van der Waals molecules; (3) results on the fragmentation of diborane behind shock fronts, showing the formation, possibly, of an unstable polyatomic intermediate, then BH and finally polymeric species; and (4) preliminary results of flash photolysis of benzene, 2-diazonium carboxylate, directed toward the identification of benzyne, C_6H_4. (Author)

Massachusetts Inst. of Tech., Cambridge.
HYDROGEN PEROXIDE LABORATORIES, by C. N. Satterfield. Quarterly periodic status rept. on Contract Nonr-1841(11). 31 Mar 60. 13p; AD-235 699.
Order from LC mi$2.40, ph$3.30 PB 153 769

Hydrogen peroxide decomposition flame: Measurements were made of the burning velocities of H_2O_2 vapor as a function of vapor concentration at atmospheric pressure. Thermocouple measurements of the vapor in a burner tube confirmed the previous belief that the temperature of the vapor between the bottom and top of the tube does not differ by more than 2°C and that the vapor at the top is normally superheated by 2° to 5°C according to the heat input to the superheater. Porous walled reactor studied: Experiments were conducted in a porous stainless steel reactor using various flow conditions. Trial runs with H_2O_2 in N were made with the main stream introduced near the middle of the reactor. Decomposition of H_2O_2 vapor on catalytic surfaces: The rate of decomposition of H_2O_2 vapor on a Ag tube decreased with time, while there was an increase of reaction rate on the surface of a Cu tube. Other experiments demonstrated the increase with time of the catalytic effect of Cu. Decomposition of H_2O_2 vapor on relatively inactive surfaces: Experiments in a 304 stainless steel tubular reactor using N as the carrier gas showed no dependence of H_2O_2 decomposition rate on the flow rate of the gas steam. This indicated that the decomposition rate was not mass transport controlled. The H_2O_2 decomposition rate was dependent on the concentration of H_2O_2 but not that of O or H_2O.

Mellon Inst., Pittsburgh, Pa.
SOLID STATE VIBRATIONAL SPECTRA OF THE METHYL AND METHYL-d_3 HALIDES, by Marilyn E. Jacox and Robert M. Hexter. Rept. on Contract AF 49(638)542. 1 Nov 60, 27p. 15 refs. [AFOSR] TN-60-1420; AD-247 745.
Order from LC mi$2.70, ph$4.80 PB 153 549

The vibrational fundamentals of solid CH_3Cl, CH_3Br, and CH_3I and of their fully deuterated counterparts have been examined at 77°K under high resolution. CH_3Cl^{35} has been synthesized and its ν_3 spectrum compared to that of ordinary CH_3Cl, permitting the assignment of the CH_3Cl^{35} and CH_3Cl^{37} contributions in the ν_3 multiplet structure. The relative intensities of absorption in 1:1 CH_3X:CD_3X solid solutions have been measured to test the relationship between splitting, frequency, and absorption intensity predicted by the dipolar correlation model. The test proved to be insensitive. A study of the ν_3 absorption of each component in CH_3Cl:CD_3Cl solid solutions throughout the concentration range has shown that multiplet splitting persists at concentrations as low as 1%. (Author)

Metal Hydrides, Inc., Beverley, Mass.
ATTEMPTED SYNTHESIS OF BERYLLIUM HYDRIDE, by John C. Powers, Donald W. Vose, and Edward A. Sullivan. Rept. for June 58-July 59 and May-Aug 60 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5847. Oct 60, 35p. 12 refs. WADD Technical rept. 60-543.
Order from OTS $1.00 PB 171 489

The direct synthesis of beryllium hydride from the elements was attempted in two sets of equipment designed to grind beryllium metal while subjected to heat and hydrogen pressure. Grinding action was supplied by mechanisms which provided the reaction vessels with either reciprocating vertical motion, or motion in which the reactor's horizontal axis described a circle. The ability of both mechanisms to grind metals satisfactorily was demonstrated in test runs, in which magnesium hydride was synthesized. However, beryllium hydride was not prepared by this method, even when catalytic additives were used. There were no indications even of partial hydriding. Operation with beryllium, which is highly toxic, was carried out safely by conforming to recognized standards of industrial practice. (Author)

Naval Ordnance Lab., White Oak, Md.
THE ENERGY OF DETONATION, by Sigmund J. Jacobs. 17 Sep 56, 18p. 8 refs. NAVORD rept. 4366.
Order from LC mi$2.40, ph$3.30 PB 154 813

This report released for sale to the public 16 Mar 61.

The energy of detonation is calculated for a "gamma law" gas using two simple models for the hydrodynamic problem. In the first a Taylor wave expansion follows the detonation. In the second a piston follows the detonated gas to maintain a constant pressure in it. The energy distribution in the Taylor wave is found for the case gamma equal to 3. It is shown that the average energy release by the chemical reaction per gram is given by: $e_0 = p_1/2(\gamma - 1)\rho_0$ where p_1 is the C-J pressure and ρ_0 is the initial loading density to produce that pressure. The value of gamma, taken as constant, can be evaluated from detonation pressure data. These approximate results should be of use in gaining an understanding of the disposition of energy in a detonating charge of finite dimensions. (Author)

New York U., N. Y.
BASIC RESEARCH IN X-RAY SPECTROMETRY (2-12Å), by Hartmut Kallmann. Quarterly rept. no. 12 (Final) 1 Dec 56-28 Feb 57, on Contract DA 36-039-sc-56732. May 57, 29p. AD-138 891.
Order from LC mi$2.70, ph$4.80 PB 150 895

This report released for sale to the public 7 Mar 61.

Samples which consisted of known amounts of Cu in an Sn matrix were analyzed quantitatively by means of X-ray spectrometry. The apparatus consisted of a cooled photomultiplier tube with associated electronic currents, an analyzing crystal mounted on a goniometer, slit collimators and X-ray equipment. Concentrations of 100% to 2% Cu were detected. X-ray intensities as low as 0.23 quanta/sq cm/sec for Ni K radiation (1.65 A) and 1 quantum/sq cm/sec for sulfur K radiation (5.36 A) were measured. Sensitivity decreased for softer X-rays because about 4000 ev must be absorbed by the phosphor in order to release one electron from the cathode of the photomultiplier tube. The methods investigated for the detection of low intensities of soft X-rays were (1) through the use of small photoconductive crystals of CdS, (2) by means of an ionization chamber, (3) by means of a proportional counter, and (4) by scintillation. Various phosphors were tested by irradiation with a measured intensity of As K-X-rays (10.6 kv) and comparing the relative efficiency of each. The effect of the increase in light emission by the phosphors when irradiated by a constant intensity of X-rays was studied. The increase was greater when the irradiation was performed at dry ice temperature.

Pennsylvania State U. Coll. of Chemistry and Physics, University Park.
THE SOLVATION OF AMMONIUM IONS AND THE ACIDITY FUNCTIONS H_R AND H_0, by Robert W. Taft, Jr. Technical rept. no. 25 on Contract Nonr-656(05). Mar 60, 8p. 8 refs.
Order from LC mi$1.80, ph$1.80 PB 153 811

The effects on acidity of (1) solvation of ammonium ions and hydronium ion by H-bond formation and (2) acidity functions, H_0 and H_R, were studied; these 2 topics appear to be closely related. The H_0 and H_R functions differed markedly even in dilute acid solution. Experimental evidence indicates that the R^+ species solvate normally in much the same manner as quaternary alkyl ammonium ions, R_4N^+. Abnormal interactions were appeared to be generally involved with BH^+ species. In the region 44 to 64 wt-% H_2SO_4, a closely linear relationship exists between $(H_R - H_0)$ and the activity of H_2O ($-\log a_{H_2O}$). From 60 to 75 wt-% H_2SO_4, the slopes of $(H_R - H_0)$ vs $\log a_{H_2O}$ is curved. In the acidity region below 40 wt-% H_2SO_4 the slopes are curved. The results suggest that with an abundance of available molecules, additional H-bonding interactions of weak and variable strengths occur with $BH_n^+ \cdot (H_2O)_n$, ROH, and B.

Rensselaer Polytechnic Inst., Troy, N. Y.
IONIC NATURE OF MOLTEN SALTS, by George J. Janz. Final rept. on Contract AF 49(638)50. Dec 60, 17p. 12 refs. AFOSR-TR-60-176.
Order from OTS $0.50 PB 171 535

Techniques and apparatus are described for the precise simultaneous measurement of surface tension (γ), density (d), and viscosity (η) of melts up to 1000°C, and for the measurement of electrical conductance (Λ). KCl, a completely ionized melt, has an η of 1.21, a γ of 98.4, a d of 1.977, and a Λ of 114. Li_2CO_3 melts to form a liquid with a d of 1.812, a γ of 240, and a Λ of 99.0. $HgBr_2$ shows a d of 4.41, an η of 2.52, and a Λ of 10^{-2}; the liquid is essentially molecular and only incipently ionized. The Λ of an infinitely dilute solution is 115.03 for LiCl, 126.45 for NaCl, and 149.86 for KCl. The Λ of a 0.1 N aqueous solution is 95.86 for LiCl, 106.74 for NaCl, and 128.96 for KCl. The Λ of the molten salt is 170 for LiCl, 143 for NaCl. The pure molten melt corresponds to a state in which the solvent to solute ratio is 1.0/∞. A comparison of Λ values for a series of alkali halides and carbonates in the molten state

shows that molten carbonates form molten highly ionized electrolytes. The carbonate ion $CO_3^{=}$ contributes a significant part to the process of charge transport in molten carbonates. The fraction of current transported respectively by cations (t^+) and anions (t^-) in aqueous solutions is 0.4643 and 0.5357 for $AgNO_3$, 0.3963 and 0.6037 for NaCl, and 0.48 and 0.52 for $PbCl_2$. In fuzed salts these values are 0.75 and 0.25 for $AgNO_3$, 0.76 and 0.24 for NaCl, and 0.35 and 0.65 for $PbCl_2$. (See also PB 149 436, PB 151 171, PB 151 429)

Theoretical Chemistry Lab., U. of Wisconsin, Madison.
INTERMOLECULAR POTENTIAL FUNCTIONS FOR NONPOLAR MOLECULES, by Daniel D. Konowalow and Joseph O. Hirschfelder. Rept. on Contract AF 33(616)7174. Dec 60, 39p. 41 refs. ARL Technical note 60-158.
Order from LC mi$3.00, ph$6.30 PB 153 114

The Morse potential function is used to represent the intermolecular potential for several nonpolar substances. The potential constants are determined from a combination of crystal structure and second virial coefficient data for Ne, Ar, Kr, Xe, CH_4, and N2. Over a wide temperature range the theoretical second virial coefficients determined from the Morse potential for these substances agree very well with experimental data and are quite comparable with calculations using the Buckingham (exp-6) or the Lennard-Jones (12-6) potentials. For Kr, it is found that the agreement with the experimental second virial coefficients is greatly improved by dividing the intermolecular potential into two separate Morse functions, one applicable where the potential is negative and the other applicable where the potential is positive. (Author)

University of Southern California [Los Angeles].
COMPUTER SIMULATION OF AGGREGATE FORMATION, by Marjorie J. Vold. Technical rept. no. 5 on Particle Interactions in Colloidal Systems in Non-Polar Media, Contract DA 04-495-ORD-1296. Aug 60, 20p. 4 refs. OOR rept. 1923.5-C; AD-241 824.
Order from LC mi$2.40, ph$3.30 PB 153 667

Computer generated model sediments of spherical particles, formed by addition to the sediment of one particle at a time appeared in previous work to be adequate to represent the behavior of physical model systems composed of microscopic glass beads. However, sediment densities of semi-colloidal silica in hydrocarbon solvents are too low by a factor of ca. 30 to be represented by such a model. Observation suggests that the model must take flocculation and sedimentation into account simultaneously. In the work reported here model flocs have been generated and their shapes, structures and densities explored. Particle by particle addition to the floc was assumed. A sediment formed on the previous pattern from these flocs rather than from primary particles is still more dense than experimental sediments but by a smaller factor (ca. 6). A more sophisticated model is under study. (Author)

University of Southern California, Los Angeles.
PROPERTIES OF SOLUTIONS IN THE NEIGHBORHOOD OF THE CRITICAL TEMPERATURE OF THE SOLVENT, by Sidney W. Benson. Charles S. Copeland and others. Final rept. for 1 Feb 59-1 Nov 59 on Contract N6-onr-23811. 1 Apr 60, 25p. 11 refs. AD-235 316.
Order from OTS $0.75 PB 171 530

Contents:
Experimental techniques and difficulties
Dielectric properties of H_2O and EtOH
Phase diagram for H_2O-NaCl
Conductance of NaCl-H_2O systems, hydrolysis
Conductance of HCl-H_2O systems and observations on NaOH-H_2O
Conductance of NaI-EtOH system
Thermodynamic quantities, compressibility, partial molar volumes, entropies, and enthalpies
Some empirical relationships, rectilinear laws for 2-phase systems
Partial molar volumes of ions. (See also PB 135 729)

EARTH SCIENCES

Coastal Studies Inst., Louisiana State U., Baton Rouge.
THE ROLE OF ALGAE IN THE FORMATION OF BEACH ROCK IN CERTAIN ISLANDS OF THE CARIBBEAN, by Robert W. Krauss and Raymond A. Galloway (U. of Maryland). Technical rept. no. 11, part E, on Caribbean Beach Studies, Contracts N7onr-35608 and Nonr-1575(03). 20 Mar 60, 53p. 20 refs. Contribution no. 60-1; AD-235 466.
Order from LC mi$3.60, ph$9.30 PB 153 735

Notes on more than 80 beaches on Grenada, St. Lucia, Guadeloupe, and Puerto Rico are accompanied by comments on algae and other organisms with particular emphasis on the role they play in forming and modifying beach rock. It is concluded that algae are not directly responsible for cementation of beach rock. Incipient beach rock occurs in close association with the water table in the sand of beaches. Spectrographic and quantitative analyses are given for water, sand, beach rock, and a sample of algal rock, from 7 beaches. Chloride and pH values are listed and calcium content of inshore and offshore waters tabulated for 17 beaches. The conclusions advanced have general application in explaining beach rock origin generally. A detailed transect and tables showing relative abundance of various algae covering beach rock are of interest from the standpoint of reef origin. (Author)

Indiana U., Bloomington.
COMMERCIAL GEOGRAPHY OF THE GRENADINES, by Robert C. Kingsbury. Technical rept. no. 1 on Contract Nonr-908(13). May 60, 43p. 17 refs. AD-240 287.
Order from LC mi$3.30, ph$7.80 PB 149 321

Air Weather Service, Washington, D. C.
SEVERE WEATHER FORECASTING. 1 May 56, 152p. Air Weather Service Manual AWSM 105-37, supersedes AWSM 105-37, Nov 52.
Order from LC mi$7.50, ph$24.30 PB 153 659

The purpose of this manual is to outline and illustrate certain specialized methods and procedures used by the Air Weather Service Severe Weather Warning Center (hereafter abbreviated as SWWC). This outline is not intended to qualify the reader as an expert in predicting severe weather, but rather, to provide AWS forecasters and observers with a basic understanding of how the severe weather warnings which are transmitted on Air Force teletype networks in the United States are prepared. The techniques involved in forecasting tornadoes are extremely detailed, and require the preparation of so many additional charts and analysis of so much data that they are not recommended for normal weather station operational use. However, practicing forecasters may find guidance and help in this presentation, and the portions dealing with methods of forecasting wind gusts, hail, and turbulence, are sufficiently simplified so that they may be adapted for routine use in most AWS weather stations. (Author)

California U., Los Angeles.
STATIC STABILITY MEASURES IN THE ATMOSPHERE, by W. Lawrence Gates. Scientific rept. no. 3 on Dynamical Weather Prediction Project, Contract AF 19(604)4965. 31 Oct 60, 25p. 23 refs. AFCRL-TN-60-817.
Order from LC mi$2.70, ph$4.80 PB 153 745

Various measures of static stability in the atmosphere are reviewed and their uses briefly discussed. The mean vertical distribution of nine stability measures is given for 100 mb tropospheric layers, and for selected stratospheric layers. The average geographical distribution over the United States is also discussed and illustrated for the measure $-T\theta^{-1}\partial\theta/\partial p$. The seasonal differences in stability distribution are discussed from the January and July average data for forty-five United States radiosonde stations. (Author)

Imperial Coll. of Science and Tech., London (Gt. Brit.)
RADAR ANALYSIS OF A HAILSTORM, by K. A. Browning and F. H. Ludlam. Technical (scientific) note no. 5 on Contract AF 61(052)254. July 60, 107p. 28 refs. AFCRC-TN-60-426. AD-247 287
Order from LC mi$5.70, ph$16.80 PB 153 390

Observations of a summer hailstorm which travelled across England from the SW were made with five radars and a dense network of ground observers. It is shown that in the intense phase of the storm, when 2-inch hailstones fell, the radar echoes persistently showed some features from which the pattern of the air flow in the storm can be deduced. According to the analysis the updraught was composed of air which entered the storm at low levels in a NE'ly current and left it at high levels in a SW'ly current. Strong wind shear caused the updraught to be tilted at an angle of about 45° to the horizontal. Precipitation from the updraught induced a downdraught in the region beneath it; air entered the rear of the storm in the middle troposphere, descended in the downdraught and left the storm near the ground as a NE'ly current. It is suggested that in the presence of wind shear the downdraught is essential for the maintenance of organized convection, and often also for its establishment when the instability is latent. The tilted intense updraught is favourable if not essential for the growth of large hailstones, for the small stones which are carried forward from the cloud tops descend and re-enter the updraught at low levels; in this way some cloud particles can pass through the updraught twice or more, until they reach the largest size which it can support. (Author)

North American Aviation, Inc., Downey, Calif.
STUDY OF BACKGROUND RADIATION AND HIGH ALTITUDE WEATHER. Final rept. for 27 July-22 22 Oct 54 on Contract AF 33(600)24347. Dec 54, 107p. 262 refs. WADC Technical rept. 54-581; AD-54 347.
Order from LC mi$5.70, ph$16.80 PB 154 808

This report released for sale to the public 16 Mar 61.

A background radiation and high-altitude weather program was instituted by the AF to amass a body of radiation measurements on sky background, to investigate the literature in the high-altitude weather field, and to summarize the state of present knowledge of pertinent weather topics. Effort to a large extent was directed toward the development of reliable measuring equipment with which a mass of data can be gathered. Information was recorded in the field only to the extent of proving the operability of the equipment and of enabling a practical criticism of the methods of data reduction. The approach chosen in the spectral intensity measurements was to build a radiometer, and to achieve wavelength discrimination through the insertion of selective filters in the beam. Spatial variations are disclosed by a gradient meter, a specially designed instrument for scanning backgrounds in various patterns at a fairly rapid rate and with high angular resolution. After the 2 instruments were developed, it proved possible to combine them, creating a radiometer-gradient meter. This device has 2 receivers in the focal plane, a set of filters which can be employed at will, and scanning motions as desired. In one mode of operation it measures the spectral intensity of targets; in the second mode, the intensity gradients. The literature study contains information on high-altitude clouds, water vapor, ozone, CO_2, and dust. (See also AD-44 372)

Quartermaster Research and Engineering Center, Natick, Mass.
CANAL ZONE ANALOGS IX. ANALOGS OF CANAL ZONE CLIMATE IN THE FAR EAST, by Robert L. Anstey. Oct 60, 58p. 18 refs. Technical rept. EP-141.
Order from LC mi$3.60, ph$9.30 PB 153 427

The climate of the Far East is compared with that of two locations in the Canal Zone: Balboa Heights, representing the drier, leeward, Pacific side of the Isthmus

of Panama, and Cristobal, representing the wetter, windward, Atlantic side. Areas of analogy of pertinent climatic elements and combinations of these elements are shown on maps. The Far East does not contain areas of complete climatic analogy to either Canal Zone station. Winter temperatures are too low in all parts of the study area to show coincidence with the three climatic elements normally used for comparison. Nearly all of the study area is comparable with the Canal Zone stations in respect to mean temperature of the warmest month. Much of the lowland area of Japan, Formosa, southern China and a small area in extreme southern Korea have mean annual precipitation analogous to Balboa Heights, but only five areas on the southeast coast of Japan have mean annual precipitation amounts which are analogous to Cristobal. Other climatic elements, such as mean daily maximum temperature for the warmest month, and number of wet months, show large areas with analogous, or greater than analogous, conditions. Much of Japan and southern China are analogous to Canal Zone stations in mean cloudiness of the wettest month and mean relative humidity of the driest month. Mean windspeeds in the warmest month, mean precipitation of the wettest month, and mean daily temperature range of the warmest month in nearly all of the lowland portions of the study area are analogous to Balboa Heights, but only small areas are analogous to Cristobal. (Author) (See also PB 143 281)

Stanford Research Inst., Menlo Park, Calif.
STUDY OF WEATHER STATIONS FOR ARMY USE. PHASE III: DESIGN GUIDE, by R. C. Goettelman, F. L. Ludwig and others. Summary rept. on Contract DA 36-039-sc-78154. 30 Nov 59, 231p. 14 refs. SRI Project no. SU-2594; AD-234 194.
Order from LC mi$10.20, ph$36.30 PB 153 601

A guide was prepared for the design of 2 general types of automatic weather stations for Army use; these are: (1) small, portable (by 1 or 2 men) stations capable of sensing and telemetering basic weather parameters, and capable of unattended operation for 1 or 2 weeks; and (2) large, research-type stations, capable of sensing and telemetering many weather parameters of meteorological interest, and capable of unattended operation for periods from 3 mo to 1 yr. Components are suggested which should be capable of reliable operation under many climatic environments and which should provide reasonable accurate and representative data. Selections were made based on the following criteria: (1) commercial availability or straightforward development requirements, (2) long-term reliability, and (3) low power requirement. Over-all station configuration is discussed and schematic and block diagrams are presented to illustrate suggested solutions. Power source recommendations are made. The necessity to consider both environment and logistics in choosing power sources for particular situations is discussed. Power, weight, and volume estimates are made for both types of stations. (Author) (See also PB 149 711)

Travelers Life Insurance Co., Hartford, Conn.
A MOVING-COORDINATE PREDICTION MODEL APPLIED TO EAST COAST CYCLONES, by Frederick P. Ostby and Keith W. Veigas. Scientific rept. no. 1 on Contract AF 19(604)5207, continuation of Contract AF 19(604)3877. Nov 60, 81p. 28 refs. AFCRL-TN-60-675; AD-247 686.
Order from LC mi$4.80, ph$13.80 PB 153 550

A statistical prediction technique to forecast the behavior of east coast cyclones is developed using multiple linear regression analysis. The predictands are the 24-hr northward and eastward displacements of the cyclone, the 24-hr change in central pressure, and the 24-hr change in intensity. The sample consists of 352 cyclone cases. A major feature of the technique is that a moving coordinate system is employed: the observed and derived predictor information is measured relative to the cyclone center rather than at fixed geographical locations. (Author)

Weather Forecasting Research Center, U. of Chicago, Ill.
A MODIFIED "SIGMA" SYSTEM OF COORDINATES, by Wayne E. Sangster. Scientific rept. no. 1 on Contract AF 19(604)7230. Sep 60, 75p. 12 refs. AFCRL-TN-60-668. AD-247 338
Order from LC mi$4.50, ph$12.30 PB 153 443

A coordinate system is presented in which the lowest coordinate surface represents the topography of the earth's surface. Higher coordinate surfaces reflect this topography in diminishing degrees and become isobaric at and above the 500-mb level. Some basic equations of dynamic meteorology are derived in terms of this coordinate system. A numerical prediction scheme using the primitive equations of motion and this coordinate system is outlined. A method of representing the field of the horizontal pressure force in the nonisobaric coordinate surfaces, using geostrophic stream and potential functions, is described. This method is applied to a variety of synoptic situations, and the results are compared with the conventional sea-level charts. The charts of the geostrophic stream and potential functions appear to give a more accurate representation of the geostrophic wind field than do the sea-level charts. It is shown that an appreciable diurnal variation of the geostrophic wind at the ground occurs over the Great Plains if the diurnal temperature variation is large. Evidence is presented to show that adiabatic heating due to downslope motion may be a contributing factor to cyclogenesis in the lee of the Continental Divide. (Author)

Wisconsin U., Madison.
SOME ATTEMPTS AT THE EXTRAPOLATION OF STRATOSPHERIC PRESSURE PATTERNS USING TROPOSPHERIC DATA, by Harold A. Corzine, Reid A. Bryson and Lyle H. Horn. Scientific rept. no. 4 on Contract AF 19(604)5191. Aug 60, 69p. 14 refs. AFCRL-TN-60-642; AD-248 206.
Order from LC mi$3.90, ph$10.80 PB 153 608

A mean 50 mb chart is obtained by extrapolating the contour patterns at lower levels to the 50 mb level. Orthogonal polynomials are used to describe the constant pressure charts at the standard levels from

1000 mb to 100 mb. The coefficients of the polynomials are extrapolated to the 50 mb level and a mean chart reconstructed from the extrapolated coefficients. Two methods of extrapolation are discussed. One method consists of extrapolating the mean values of the coefficients, while the second involves the extrapolation of daily coefficient values which are then averaged to obtain a mean value. The polynomial descriptions indicated that the data period could be stratified into four types. The mean 50 mb chart of one of these types is obtained using the two extrapolation methods mentioned above. The relative merit of the two methods is tested and discussed. (Author)

Wright Instruments, Inc., Vestal, N. Y.
A SURVEY OF PRESSURE AND DENSITY SENSORS AND ASSOCIATED PROBLEMS FOR THE N.O.L. HASP PROGRAM, by William Finley Wright. Final rept. on Contract NOL-N60921-5608. Apr 59, 186p. 82 refs. W. I. rept. 4/59; AD-218 681.
Order from LC mi$8.40, ph$28.80 PB 154 762

This report released for sale to the public 15 Mar 61.

Contents:
Pressure, density and gas laws, and upper atmospheric considerations
ICAO atmosphere
HASP pressure or density accuracy requirements
Radar accuracy
Wind determination drop sonde vehicle and fall rates
Analog vs digital recording
Laboratory calibrations
Static pressure defect
Pressure switches
Capacitance diaphragm transducers
Inductance diaphragm pressure transducers
Bourdon tube gage
Hypsometers
Glow discharge gages
Ionization gages
Thermal conductivity gages
Beta ray backscattering

Geodesy

Aero Service Corp., Philadelphia, Pa.
DEVELOPMENT OF CHART REVISION PLOTTER, by E. M. Rhodes. Final technical rept. on Contract AF 33(600)33646. 28 Sep 59, 87p. 16 refs. RADC-TR-59-219; AD-230 794.
Order from LC mi$4.80, ph$13.80 PB 153 886

The approach to the solutions for a map revision instrument is studied. Results of the testing of a prototype instrument are reported. Efforts were directed primarily toward the solving of optical, rectification and light transmission problems. (Author)

Institute of Geodesy, Photogrammetry and Cartography, Ohio State U. Research Foundation, Columbus.
ASSEMBLY OF GRAVITY DATA, by W. A. Heiskanen. Rept. no. 11 (Final) on Contract AF 19(604)1963. Dec 59, 95p. 85 refs. RF Proj. 716-Final; AFCRC-TR-60-238; AD-238 248.
Order from LC mi$5.40, ph$15.30 PB 154 810

This report released for sale to the public 16 Mar 61.

Attention is given to the theoretical studies, the practical procedure, and results of the gravimetric method. Maps showing the available gravity material, the status of the isostatic reduction, and the mean free air anomalies of 5°X5° squares are included. Three graphs illustrating the development of the free air gravity anomalies in spherical harmonics (Legendrians) to 8th degree for flattening values 1:297.0 and 1:298.3 are included. (Author)

Oceanography

Dartmouth Coll., Hanover, N. H.
DEVELOPMENT OF SURFACE MORPHOLOGY ON FLETCHER'S ICE ISLAND, T-3, by David D. Smith. Scientific rept. #4 on Contract AF 19(604)2159. 15 Feb 60, 77p. 17 refs. AFCRC-TN-60-437.
Order from LC mi$4.50, ph$12.30 PB 153 482

Fletcher's Ice Island, a mass of fresh-water ice adrift in the Arctic Ocean, is composed primarily of iced firn which contains numerous elongate, lensoid bodies of old lake ice that formed during buildup of the parent Ellesmere Ice Shelf. The parallelism of these bodies imparts a pronounced structural grain to the island. Superposed on the two bedrock ice types are large pads of modern lake ice formed after unusually short, cool summers within the last 5 years. Ablation causes a progressive, though non-cyclic sequential development of surface forms characterized by repeated inversion of relief. Ice units having higher albedo values and more favorable crystal structure weather into prominence. The surface of the island has a gently undulating topography made up of numerous broad, parallel ridges and intervening narrow but shallow valleys; together, these forms comprise the first order relief. Second order relief features are present on the first order ridges. These consist of 1) long narrow ridges underlain by bodies of resistant old lake ice, 2) interridge valleys and lowlands underlain by non-resistant iced firn, and 3) mesa-like forms which develop on the modern lake ice pads. A variety of third order or microrelief forms are also present. First order ridges develop in areas where resistant second order ridges are concentrated; first order valleys form in intervening areas where second order ridges are more widely spaced. (Author)

Lamont Geological Observatory, Palisades, N. Y.
DREDGED GRAVELS FROM THE CENTRAL ARCTIC OCEAN, by Walter Schwarzacker and Kenneth Hunkins. Scientific rept. no. 2 on Contract AF 19(604)2030. Oct 60, 29p. 20 refs. AFCRC-TN-60-258; AD-246 243.
Order from LC mi$2.70, ph$4.80 PB 153 076

A series of nine bottom trawls was made in the Arctic Ocean from Drifting Station Alpha. The trawls were taken in the area between 84° and 85°N and between 138° and 152°W. All the trawls produced high percentages of gravel. Macroscopic and microscopic analyses showed these gravels to be predominantly sedimentary rocks, few igneous or metamorphic specimens were found. One fossiliferous sandstone specimen is Permocarboniferous in age. Bottom cores contained similiar pebbles at depths in the sediment of up to 115 cm below the bottom. Studies of the striation, roundness and shape of the pebbles reveal them to be typically glacial material which has undergone little or no water transport. It is concluded that these gravels have been rafted by ice from a shore containing active glaciers. Considerations of Arctic Ocean circulation, Pleistocene glaciation and lithology make it probable that the source area was Axel Heiberg Island, Ellesmere Island or the northern coast of Greenland. (Author)

Lamont Geological Observatory, Palisades, N. Y.
SEISMIC STUDIES OF THE ARCTIC OCEAN FLOOR, by Kenneth Hunkins. Scientific rept. no. 1 on Contract AF 19(604)2030. Oct 60, 34p. 9 refs. AFCRC-TN-60-257; AD-246 242.
Order from LC mi$3.00, ph$6.30 PB 153 075

Reflection and refraction seismic measurements from Drifting Station Alpha in the Arctic Ocean have revealed details of a prominent submarine rise, called the Alpha Rise. This feature trends across the Arctic Ocean subparallel to the Lomonosov Ridge. The minimum depth sounded in its central portion was 1426 meters at 85° 03'N and 171° 00'W. The rise descends to depths of over 3000 meters to the north and south. Sub-bottom reflections reveal a characteristic echo from a depth of several hundred meters below the ocean floor in the eastern area of the rise. This reflection is not pronounced in the western area. The eastern area also has a rougher bottom texture than the western area. Several short unreversed refraction profiles were made. Dips and strikes of the ocean floor from reflection records aided interpretation. An average of three measurements shows the upper "unconsolidated" layer to be 0.38 kilometers thick. One profile revealed a 2.80 kilometer thick layer of 4.70 km/sec velocity. Below this lay the "oceanic" layer with a velocity of 6.44 km/sec and an undetermined thickness. (Author)

Physics of the Atmosphere

Advanced Electronics Center, General Electric Co., Ithaca, N. Y.
A DETAILED DESIGN STUDY FOR A TOPSIDE IONOSPHERIC SOUNDER, VOLUME II, by Leonard C. Humphrey. Scientific rept. no. 1 on Contract AF 19(604)7221. 15 Oct 60, 40p. 4 refs. AFCRL-TN-60-1125 (II). AD-247 284.
Order from LC mi$3.00, ph$6.30 PB 153 399

This volume summarizes the design of a Topside Ionospheric Sounder, detailed in Volume I (PB 153 050) and outlines an action plan for implementing the satellite and the necessary equipment for the ground support complex. The Topside Sounder is an instrumented satellite system designed to make continuous topside measurements of the entire ionosphere over the earth. This instrument fulfills the requirement of an urgently needed basic research experiment and is a high-potential tactical tool. Reconnaissance of the upper ionosphere will make possible detection and observation of remote electromagnetic disturbances that are artificially as well as naturally induced. (Author)

Avco-Everett Research Lab., Mass.
ABSOLUTE INTENSITY OF NON-EQUILIBRIUM RADIATION IN AIR AND STAGNATION HEATING AT HIGH ALTITUDES, by J. C. Camm, B. Kivel and others. Rept. on Contracts AF 04(647)278 and DA 19-020-ORD-4862. Dec 59, 37p. 17 refs. Research rept. 93; AFBMD TR-60-184.
Order from LC mi$3.00, ph$6.30 PB 153 569

An attempt to obtain the magnitude of the non-equilibrium radiation behind a normal shock in air is reported. It is noted that the high non-equilibrium temperatures force one to extend studies further into the uv and ir than required for equilibrium predictions of significant sources of radiation. For example, to ascertain that the total non-equilibrium radiation is less than 1 w/cm^2 requires measurements from several hundred angstroms to more than 10 microns. Measurements covering much of this region using: (1) monochromator and photocells, (2) bolometers, (3) photoelectric detectors, (4) spectrographs and, (5) ir photocells, are reported. At 23,000 ft/sec the radiation integral normal to the shock is about 0.4 watt/cm^2 steradian and most of the radiation originates within 5 cm of the shock front. We also report on calculations which show that the effect of ambient atomic oxygen at high altitudes does not introduce any pronounced changes. Application of the results to the problems of satellite heating is made. (Author)

California U., Los Angeles.
SOLUTION OF RADIATIVE TRANSFER IN AN INFINITE SCATTERING MEDIUM ILLUMINATED BY A POINT SOURCE, by Jacqueline Lenoble. Scientific rept. no. 6 on Light in the Atmosphere, Contract AF 19(604)2429. Oct 60, 14p. 1 refs. AFCRL-TN-60-816. AD-248 028.
Order from LC mi$2.40, ph$3.30 PB 153 566

The method of expansion in series of spherical harmonics is applied to the problem of radiative transfer in a scattering medium homogeneous and infinite, illuminated by an isotropic point source. Starting with the solution of the problem of neutron transport with spherical symmetry and without source, a very simple formula for the diffuse luminance is given. (Author)

Electrical Engineering Research Lab., U. of Texas, Austin.
SOLAR EMISSION AND ATMOSPHERIC ATTENUATION BETWEEN FREQUENCIES OF 100 AND 114 KMCS, by C. W. Tolbert, L. C. Krause, and W. W. Bahn. Rept. on Contract AF 19(604)2249, 20 Oct 60, 29p. 13 refs. Rept. no.6-39; AFCRL-TN-60-1113; AD-246 059.
Order from LC mi$2.70, ph$4.80 PB 153 081

Measurements were made of the atmospheric attenuation and equivalent solar blackbody temperature at the frequencies of 100.0, 109.8 and 114.0 kmcs from an elevation of 0.25 km at a site near Austin, Texas. Observations were also made in frequency ranges of calculated molecular ozone and carbon monoxide lines. The solar equivalent blackbody temperature was found to have a value of 5870 ± 950° K at 100.0 kmcs and a value of 5500 ± 715° K at 109.8 kmcs. The atmospheric attenuation measured between 12 July and 13 September 1960, had values between 1.2 decibels and 5.4 decibels. When correlated with the total atmospheric precipitable water, the attenuation was found to have a value of 0.32 decibel gram^{-1} centimeter^{-2} at 100.0 kmcs, 0.57 decibel gram^{-1} centimeter^{-2} at 109.8 kmcs and 1.00 decibel gram^{-1} centimeter^{-2} at 114.0 kmcs. No emission or absorption anomalies were observed in the vicinity of the calculated frequencies of the ozone and carbon monoxide lines. (Author)

Intermountain Weather, Inc., Salt Lake City, Utah.
ATMOSPHERIC RADIATIVE FLUX IN THE 6.3 MICRON TO 8.2 MICRON INTERVAL, by J. Vern Hales, Thomas A. Studer, and Donald Henderson. Scientific rept. #2 on Contract AF 19(604)2418. 15 Aug 60, 22p. 12 refs. AFCRL-TN-60-638.
Order from LC mi$2.70, ph$4.80 PB 153 635

Using the radiative transfer equations in the form given by Elsasser, R(u,T) tables needed to determine the atmospheric radiative flux in the 6.3 to 8.2 micron interval were computed. Values of constants, etc., used by Elsasser (1960) were used. Flux computations were made by a numerical integration of R(u,T) using the moisture and temperature distribution given by the radiosonde sounding of 29 April 1959 at Holloman Air Force Base, New Mexico. Comparisons were made with balloon measurements made by Strong at the same time and in the same spectrum interval. The computed net flux was found to agree with the measured flux within reasonable limits. (Author)

Ionosphere Research Lab., Pennsylvania State U., University Park.
INSTRUMENTATION FOR ROCKET MEASUREMENTS OF ELECTRON DENSITY IN THE IONOSPHERE, by E. A. Mechtly, R. W. Hamaker and others. Scientific rept. no. 127 on Ionospheric Research, Contract DA 36-061-ORD-577. 1 Jan 60, 98p. 8 refs. AD-236 787.
Order from LC mi$5.40, ph$15.30 PB 147 532

The development and testing of instrumentation for the measurement of electron density in the ionosphere by means of rockets is reported. Circuit diagrams, performance characteristics, and test procedures are given. Several observations made by this instrumentation and telemetered from rockets in flight are shown. (Author)

Lincoln Lab., Mass. Inst. of Tech., Lexington.
CONVECTION AND DIFFUSION OF IONIZATION IN THE E-LAYER, by H. Feshbach and F. Villars. Rept. on Contract AF 19(604)7400. 1 Dec 60, 50p. 17 refs. 33G-0014; AD-248 362.
Order from LC mi$3.30, ph$7.80 PB 153 698

It has been suggested that auroral backscattering of radio waves in the frequency range from 100-800 mc/sec is due to the joint action of turbulence and earth's magnetic field, which was assumed to produce small scale elongated irregularities of ionization lined up with the earth's field. The present work investigates solutions of the equation for diffusion and transport of ionization in a weakly ionized turbulent plasma in the presence of a magnetic field. Due to space charge effects, the problem is non linear in the ionization density $n(\vec{x}, t)$. In the linearized approximation the effect of the magnetic field on turbulence does not lead to irregularities of a scale sufficiently small to explain the observed data. Non linear effects may play a role and are presently being investigated. (Author)

Little, Arthur D., Inc., Cambridge, Mass.
MEASUREMENT OF THE UPPER-ATMOSPHERE DENSITY. Rept. on Contract AF 19(604)4127. 2 Feb 59, 92p. 14 refs. C-61489; AFCRC-TR-59-217; AD 230 944.
Order from LC mi$5.40, ph$15.30 PB 153 586

A study was conducted to determine whether estimates of the upper-atmosphere density can be obtained from measurements of the drag on a fast-moving body in the altitude range of 150 to 400 mi, and if estimates are feasible to devise methods and apparatus for making and reporting the required measurements. Correlations are available which will permit accurate density measurements up to altitudes of 250 mi and reasonably good estimates up to 400 mi. Information on satellite electrical potential or atmospheric electron flux is needed to secure improved accuracy at the upper altitude extremes. Drag forces on bodies moving at near satellite velocity can be measured if they have area-to-weight ratios greater than about 0.23 ft^2/lb. For standard satellites, such ratios can be obtained by having the satellite tow a large, lightweight balloon. Balloons ejected overboard from ICBM's also would have adequate velocities and area-to-weight ratios. Measurement of the drag force is possible either as a tension force in the tow line of a satellite trailing a lightweight drag device or as an acceleration of the satellite. Instrumentation and mechanisms for making the measurements are partially specified. (Author)

National Research Labs., Ottawa (Canada).
ATMOSPHERIC TURBULENCE ENCOUNTERED BY A FAIRCHILD C-119 AIRCRAFT OVER THE CANADIAN ARCTIC, by R. T. Sewell. Nov 60, 22p. 2 refs. Aeronautical rept. LR-290.
Order from LC mi$2.70, ph$4.80 PB 154 058

V-G-H records were obtained from a Fairchild C-119 aircraft operating between Thule, Greenland and Alert, Ellesmere Island, covering a period of approximately 50 flying hours between 31 July and 11 August 1960. From the limited number of records obtained, it would appear that the frequency of occurrence of

vertical gusts exceeding 10 feet per second equivalent velocity is considerably lower than that suggested by the Royal Aeronautical Society as representing a world-wide average. However, it is considered that the analysis does not represent a true statistical average, and the results may be considerably modified if records were to be obtained over a longer period. (Author)

New York U. Coll. of Engineering, N. Y.
THE PROBING OF THE TROPOPAUSE BY BALLOONS THAT FOLLOW IT: A SUGGESTION, by Wan-cheng Chiu. Scientific rept. no. 1 on Contract AF 19(604)6146. Oct 60, 16p. 8 refs. AFCRL-TN-60-808; AD-248 280.
Order from LC mi$2.40, ph$3.30 PB 153 643

The major mystery of the tropopause is considered to be the sharpness of the change of the temperature gradient that is often associated with it. It is proposed that constant level balloons be employed to follow the tropopause and to probe its detailed temperature structure. The way that this may be done is briefly outlined. (Author)

Nichols Chemistry Lab., New York U., N. Y.
THE REACTION OF NITROGEN ATOMS WITH OZONE, by H. Austin Taylor and Mei Chio Chen. Final rept. on Contract AF 19(604)2076. 15 Oct 60, 19p. 11 refs. AFCRL-TR-60-420; AD-248 192.
Order from LC mi$2.40, ph$3.30 PB 153 567

The reaction of ozonized oxygen and active nitrogen at room temperature has been shown to produce, almost exclusively, nitrous oxide. Rate measurements in a flow system have been analyzed as involving a primary reaction $N + O_3 \rightarrow NO + O_2$. Accepting present values for the specific rates of subsequent reactions of nitric oxide, the rate of the primary reaction is found to be 10^{10} ml/mole sec. This is several orders faster than the reaction of nitrogen atoms and oxygen molecules and many orders faster than the three-body recombination of atomic nitrogen and atomic oxygen, substantiating the Barth-Kaplan suggestion of the probable source of nitric oxide in the upper atmosphere. (Author)

Ohio State U. Research Foundation, Columbus, Ohio.
SURVEY OF THE LITERATURE ON RADIATION IN THE ATMOSPHERE, by J. H. Shaw. Technical rept. no. 1 on Contract DA 36-039-sc-78153. Sep 58, 179p. 405 refs. RF proj. 854; AD-210 805.
Order from LC mi$8.10, ph$27.30 PB 150 896

This report released for sale to the public 8 Mar 61.

A survey of the literature pertaining to radiation in the atmosphere from the sun, the earth, the sky and the clouds that influences the measurement of atmospheric temperature from sea level up to 150,000 ft has been made. Literature from which evaluations can be made of the errors due to radiation on the measurement of temperature, and of methods and techniques for correcting for these radiation errors, is also included in this survey. The results are presented in the form of an annotated bibliography.

ENGINEERING

Burns and Roe, Inc., New York.
A LOGISTIC STUDY OF NUCLEAR AND CONVENTIONAL POWER PLANTS FOR THULE, GREENLAND. Rept. on Contract AF 30(602)2095. June 60, 132p. 14 refs. RADC-TR-60-85; AD-238 286.
Order from LC mi$6.90, ph$21.30 PB 153 931

This report released for sale to the public 16 Mar 61.

This report covers a study made to determine the comparative costs of logistic support for conventional vs. nuclear facilities as sources of power and steam heat for the Air Force Base and Ballistic Missile Early Warning System (BMEWS) at Thule, Greenland. The existing conventional facilities consist of a floating power ship with three oil fired boilers and three steam turbines, backed by 27 land-based diesel generators and 43 package-type heating boilers. The conceptual nuclear plant is designed to furnish all electric power and heating steam normally produced by the conventional facilities. The results of the logistic cost comparison indicate that an annual saving of roughly $528,600 to $854,000 may be realized by utilizing nuclear power and steam generating facilities in place of the existing conventional facilities. These savings are brought about by drastically reducing the diesel fuel requirements, the transportation costs of which constitute 85 percent of the conventional plant logistic costs. Although not included in the Scope of Work, development of the study also revealed that an annual saving of approximately $1,000,000 in fuel costs could be realized by utilizing nuclear power. The results of the study indicate that the advantages of lower fuel and logistic supply costs inherent in the nuclear plant should be given serious consideration when the relative merits of conventional and nuclear facilities are compared. (Author)

Aeronautical Engineering

Aerojet-General Corp., Azusa, Calif.
HYPERVELOCITY DATA RECORDING STUDY, by G. J. Woffinden. Final rept. on Contract AF 08(603)4558. Feb 59, 155p. 128 refs. Rept. no. 1541 (Final); APGC-TR-59-33 (I); AD-216 295.
Order from LC mi$7.50, ph$24.30 PB 154 758

This report released for sale to the public 15 Mar 61.

Recommendations are provided for the instrumentation of a hypervelocity facility designed for the study of the target impact effect of small projectiles. The data include the velocity, size, and flight characteristics of the projectiles, details of impact, and resulting effects on various types of targets. Recommendations include (1) the use of flash X-ray units and high-speed framing camera for measurements of size and flight characteristics; (2) flash X-ray units, a framing camera and Kerr cells for the observation of impact details and target effects; (3) time-interval meters (counters) and flash X-ray units for velocity determi-

nations; (4) synchronization techniques allowing maximum precision, reliability, and versatility of the data-recording system; and (5) gas discharge tubes, argon bombs, and exploding wires, illumination sources for photographic-lighting techniques. Optical, X-ray, electrical, and mechanical methods of data recording were surveyed. (Author)

Aeronautical Research Lab., Air Force Research Div., Wright-Patterson AFB, Ohio.
STABILITY STUDIES FOR THE TWIN WHEEL LANDING GEAR, by Artie M. Vahldiek. Dec 60, 46p. 8 refs. ARL Technical rept. 60-282.
Order from LC mi$3.30, ph$7.80 PB 152 583

The mathematical equations for the system of twin corotating nosegear contain nineteen parameters. This report is an attempt to supply the results of studies that were performed by varying various theoretical values of these parameters and contains three significant features which it is believed appear in print for the first time: a. Proof that the stability of the gear is not a friction phenomenon but is an elastic effect; b. A new approach to stability margin; and c. A twin wheel parameter study. Included, also, are studies showing these parameter variations using the dimensions of a proposed commercial jet aircraft. (Author)

Air Force Flight Test Center, Edwards AFB, Calif.
F-104C WORLD'S ALTITUDE RECORD, by Johnny G Armstrong and Joe B. Jordan. Apr 60, 36p. AFFTC-TN-60-10; AD-236 865.
Order from LC mi$3.00, ph$6.30 PB 153 591

This report released for sale to the public 15 Mar 61.

On 14 December 1959, a new world's altitude record of 103,395.5 feet was set by a modified F-104C aircraft. A new time to climb record was also set during the same flight of 15 minutes 4.92 seconds to reach 30 kilometers. In order to obtain this record altitude the aircraft was required to fly faster and slower than ever before. The zoom was started from 2.35 Mach number at 39,600 feet with a climb angle of almost 50 degrees which resulted in a minimum indicated airspeed of 54 knots at the peak altitude. The test aircraft was modified by Lockheed Aircraft Corporation at Palmdale, California. An F-104B tail assembly was installed in order to improve the directional stability. The inlet cone was modified in order to improve the airflow to the engine at the higher supersonic speeds. Engine thrust was increased by increasing maximum engine speed and afterburner fuel flow. The record flight was witnessed by officials of the National Aeronautic Association. Askania records of the flight have been sent to the Federation Aeronautique International in Paris, France for their official ruling. (Author)

Armour Research Foundation, Chicago, Ill.
LIQUID OXYGEN CONVERTER, by John Bitten. Rept. for 16 Sep 59-15 Aug 60 on Equipment for Life Support in Astronautical Operations, Contract AF 33(616)6756. Oct 60, 66p. 76 refs. Rept. no. ARF 3164-12; ARF Proj. C 164; WADD Technical rept. 60-669.
Order from OTS $1.75 PB 171 554

A 5-liter zero gravity liquid oxygen converter based on the paramagnetic and surface tension properties of liquid oxygen was designed, and a prototype unit was constructed. The design study showed that the magnitude of the magnetic or surface tension forces is sufficient to operate the unit under zero gravity conditions. Investigations showed that possible operational and construction problems due to thermal stresses in the magnet, the magnetic field on the gaging system, the physical properties of the liquid oxygen, and the wettability of the metal tubes by the liquid oxygen will not adversely affect the construction or operation of the converter. Theoretical calculations determined the magnitude of the magnetic forces on various sizes of liquid oxygen droplets and correlated the data obtained from measuring the flow rate of liquids in horizontal capillaries. (Author)

Army Transportation Research Command, Fort Eustis, Va.
ROTOR BLADE PROTECTIVE COVERS, by Robert M. Bernardin. Final rept. on Project 9R38-01-017-51. Oct 60, 32p. 7 refs. TREC Technical rept. 60-19; AD-248 210.
Order from OTS $1.00 PB 171 514

The report covers the investigation of and development of design criteria for improved equipment for environmental protection of Army helicopter rotor blades. Included is the construction and laboratory testing of an experimental model cover. (Author)

Courtney and Co., Philadelphia, Pa.
STAFF DEVELOPMENT IN SYSTEMS RESEARCH TECHNIQUES, by J. S. Kidd and K. M. Michels. Rept. on Contract FAA/BRD-85. 15 Aug 59, 149p. 16 refs. Rept. no. 29.
Order from OTS $3.00 PB 171 510

Contents:
Pt. 1. Research methods in the analysis, design, and evaluation of man-machine systems
Pt. 2. Statistical techniques

Federal Aviation Agency, Atlantic City, N. J.
DEVELOPMENT OF A HEAD-MOUNTED CAMERA FOR RECORDING PILOTS' EYE MOVEMENTS, by E. E. Pazera. Mar 60, 31p. 3 refs. Task assignment no. 59-205.9.
Order from OTS $1.00 PB 171 506

One phase of a study of cockpit visibility requirements for Army liaison-reconnaissance-type aircraft called for the evaluation of the visual performance of Army pilots. A head-mounted camera was developed to implement this investigation. This report describes the camera's development and the general aspects of its use. (Author)

Federal Aviation Agency, Atlantic City, N. J.
TRANSPORT AIRCRAFT COCKPIT VOICE RECORDING, by F. W. Jefferson. Final rept. on Task D/E-1-6089. Dec 60, 20p.
Order from OTS $0.50 PB 171 505

Tests were conducted at the National Aviation Facilities Experimental Center utilizing three aircraft, a C-131, a DC-3, and a Grumman Gulfstream, to determine the most desirable method for recording crew conversations as an aid to accident investigation. Currently available area and individual pickup-type microphones were employed. The application of electronic noise-filtering and noise-cancelling techniques was investigated for improving the intelligibility of the recorded voice. The recording of crew conversation in transport aircraft utilizing area pickup-type microphones is feasible. (Author)

Flight Accessories Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
DETERMINATION OF A STANDARD EXTINGUISHING AGENT FOR AIRBORNE FIXED SYSTEMS, by Ralph L. Hough. Oct 60, 62p. 40 refs. WADD Technical rept. 60-552.
Order from OTS $1.75 PB 171 552

This report presents investigations to determine the optimum chemical liquid extinguishing agent for use in airborne fixed systems at high temperatures. The development history, theories of flame inhibition, and the design of airborne fixed systems are examined. Agents included bromochloromethane, dibromodifluoromethane, bromotrifluoromethane, bromochlorodifluoromethane, and trichlorofluoromethane. Effectivity test showed that trichlorofluoromethane is inferior to the bromine-containing agents. The agent should be selected by the temperature requirements for the agent-container system. For temperatures to 250°F, bromochloromethane is superior, for temperatures to 350°F, dibromodifluoromethane is best; and for temperatures to 400°F, bromochlorodifluoromethane is best. No agent is suitable at temperatures above 400°F. (Author)

Harvey Aluminum, Inc., Torrance, Calif.
EXTRUSION DIE DEVELOPMENT: TITANIUM AND STEEL, by G. A. Moudry, R. B. Simonson and A. Toy. Final Technical engineering rept. for 1 Feb 58-30 Nov 59 on Contract AF 33(600)36303. July 60, 145p. 36 refs. AMC Technical rept. 60-7-577; AD-247 359.
Order from OTS $2.75 PB 171 529

Precision hot extrusion of titanium and steel structural sections for aircraft, missiles, and aerospace vehicles may be accomplished most effectively with bonded carbide or M-36 high speed steel dies and a lubricant of the graphite-moly-disulphide type. Friction Studies: cobalt-bonded carbides yielded the consistently best friction test results. A 9 percent Co content is suggested. A nickel-bonded titanium carbide yielded results comparable to the carbides. The other most promising group, was the flame-sprayed oxides and silicates; in particular, zirconium silicate and magnesium aluminate spinel. The high alloy steels and nitrided and carburized alloy steels were not as resistant to wear and seizing. Carbide yielded a superior extrusion, provided the ram speed did not exceed 2 to 4 inches per second. Extrusions from the high speed steel dies were also excellent. The high speed steel is more suitable for short runout, where a larger number of billets are to be extruded. It is difficult and time consuming to fabricate dimensionally stable carbide dies. Based on these considerations, the general use of steel dies is indicated. These may be improved by carburizing or nitriding.

Institute of Transportation and Traffic Engineering, U. of California, Berkeley.
AN EVALUATION OF SURFACE-MOUNTED LIGHTS FOR RUNWAY GUIDANCE, by Dan M. Finch and Robert Horonjeff. Final rept. on Contract FAA/BRD-4. June 60, 18p. 3 refs.
Order from OTS $0.50 PB 171 507

The concept of providing visual guidance by means of closely spaced, low-wattage light sources mounted on the surface of the runway or taxiway in lineal patterns is described in this report as well as in the prior reports related to this contract. The centerline lighting system at San Francisco International Airport was rehabilitated after the 1958-59 tests to permit further evaluation during the winter of 1959-60. It turned out that the 1959-60 winter season was very mild; there were, however, some periods of reduced visibility wherein a limited amount of bad weather evaluation was obtained. The 1959-60 test data verified the previous observations in which very favorable pilot reactions were obtained in clear weather operations. The few observations that were made in poor visibility also indicate that the centerline system is a desirable adjunct to the existing lighting system. But an evaluation of the system in very poor visibility conditions is still incomplete. (Author)

Naval Research Lab., Washington, D. C.
AN ANALYSIS OF THE RELATIONSHIP BETWEEN THE COLLISION-AVOIDANCE TRAJECTORY OF AN AIRCRAFT AND ITS PERFORMANCE CAPABILITY, by P. A. Crafton. Interim rept. 24 Jan 61, 13p. 1 ref. NRL rept. 5578.
Order from OTS $0.50 PB 171 052

The problem of the avoidance of collision between aircraft on curvilinear flight trajectories has been the subject of an earlier investigation and is here further analyzed in order to obtain a relationship between the collision-avoidance trajectory required of an aircraft and its ability to meet the requirement. On this relationship would rest the verification of an avoidance path before an aircraft actually enters upon the path. (Author)

Pitman-Dunn Labs. [Group] Frankford Arsenal, Philadelphia, Pa.
STUDY OF SENSITIVITY RESPONSE OF BARIUM TITANATE ACCELEROMETERS SUBJECTED TO VARIOUS EXTREMES OF CLIMATIC ENVIRONMENTS, ACOUSTIC NOISE AND SHOCK TESTS, by Aleck Goldberg. 3 Aug 58, 19p. Technical rept. S-5584; AD-159 318.
Order from LC mi$2.40, ph$3.30 PB 154 424

This report released for sale to the public 8 Mar 61.

This report discusses the effects on the sensitivity of barium titanate accelerometers when subjected to the following conditions; (1) extreme temperature environ-

ments. (2) exposure to salt fog and rainfall, and (3) applied tranverse shocks. In addition the response to acoustic noise field was determined. Four (4) to eleven (11) G of acceleration response resulted from acoustic excitation of 125 to 135 decibels of field intensity. The results of extreme temperature environments on accelerometer sensitivity indicate the need of accelerometer sensitivity evaluation in its particular temperature environment. Little or no effects are due to transverse shock and rainfall. Salt fog exposure produced functional failure in two (2) out of three (3) accelerometers tested. (Author)

Princeton U., N. J.
A STABILITY ANALYSIS OF TILT-WING AIRCRAFT (ANALYTICAL) by Charles H. Cromwell, III and Henry E. Payne, III. Rept. on Contract Nonr-1858(14). May 60, 176p. 10 refs. Rept. no. 477; AD-239 964.
Order from LC mi$8.10, ph$27.30 PB 149 354

A general development of methods for predicting the aerodynamic stability derivatives of propeller-driven tilt-wing vertical take-off and landing (VTOL) aircraft is presented. The concept of slipstream dynamic pressure (q") is reviewed along with the basic assumptions behind it and their limitations. The use of q" is then extended to give a semi-empirical method of predicting lift and drag on a wing, at any tilt angle, which is fully immersed in slipstream. This analysis is justified by experimental data, and other wind tunnel data which was taken for a general tilt-wing transport model is presented. The linearized small-perturbation equations of motion are reviewed and then adapted to the tilt-wing aircraft. The aerodynamic terms in the stability derivatives are evaluated in general form using either experimental data or the theoretical method previously mentioned to account for the wing's contributions. The other components of the aircraft considered as contributing to stability are propeller, fuselage and tail. The methods devised for predicting the stability derivatives are then used to make an illustrative series of calculations for the Hiller X-18 test bed. The stability roots are calculated and the aircrafts' characteristic response is determined by use of an analog computer. (Author)

Princeton U., N. J.
A STABILITY ANALYSIS OF TILT-WING AIRCRAFT (EXPERIMENTAL) by Henry E. Payne, III and Charles H. Cromwell, III. Rept. on Contract Nonr-1858(14). May 60, 53p. 14 refs. Rept. no. 478; AD-239 963.
Order from LC mi$3.60, ph$9.30 PB 149 355

An experimental investigation of longitudinal forces and moments acting on a generalized tilt-wing assault transport was conducted in order to extract the necessary stability derivatives for use in the equations of motion. Since this was the first true VTOL aircraft to be tested in the Subsonic Aerodynamics Laboratory, new facilities and techniques were developed for obtaining complete and accurate VTOL hovering and transition data. A wind tunnel was modified to give the necessary ground clearance, and strain gauge instrumentation was successfully developed for obtaining total model forces and moments as well as propeller contributions. The primary forces acting on an inclined propeller, thrust, normal force, and pitching moment, were completely determined over a range of tilt angles from 0 - 90° for two propeller pitch settings in both the propeller-alone configuration and the propeller-wing configuration. (Author)

Systems Technology, Inc., Inglewood, Calif.
A SYSTEMS ANALYSIS VIEW OF LONGITUDINAL FLYING QUALITIES, by Duane T. McRuer, Irving L. Ashkenas, and C. L. Guerre. Rept. on Contract AF 33(616)5661. Jan 60, 116p. 22 refs. Wadd Technical rept. 60-43.
Order from OTS $2.50 PB 171 551

Pilot describing functions and airframe transfer functions are combined within a servo analysis framework to develop a partial theory of longitudinal flying qualities. Criteria and procedures are established for estimating both pilot dynamic behavior and opinion.. Tentative criteria for certain pitch angle, normal acceleration and air speed to elevator transfer function quantities are derived and compared with existing pilot opinion data. New parameters of possible significance are identified. The report contains a summary of pilot dynamic capabilities in closed loop tasks and airframe longitudinal transfer function parameters and characteristics. (Author)

Texas Instruments, Inc., Dallas.
THE STUDY AND DEVELOPMENT OF CLOSELY REGULATED ELECTRIC POWER GENERATING AND CHARGING SYSTEMS FOR US ARMY AIRCRAFT, by Wilson W. Fortner. Final rept. for 15 June 58-31 May 60 on Contract DA 36-039-sc-78003. 31 May 60, 168p. 30 refs. Rept. no. 8-40500-8; AD-246 013.
Order from LC mi$7.80, ph$25.80 PB 153 933

No usable correlation between the transistor breakdown data and the measureable parameters of the individual transistors was noted. Good correlation exists between the destructive breakdown data and the junction type. The junctions are listed in descending order of breakdown levels: grown-diffused transistors, grown junction transistors, diffused base mesa transistors, and alloy junction transistors. The non-destructive transistor breakdown data indicates the relation between pulse width and pulse amplitude required to break down the transistor. The pulse energy required to break down a transistor was almost constant for the range of pulse widths tested. The transistor will first break down in a non-destructive manner. If it receives sufficient energy, the parameters (i.e., d-c beta) will change or the transistor may be destroyed (normally by shorting). In the broken down condition, a transistor presents a very low impedance to the transient. This tends to protect the transistor from transients of high source impedance. Transients of sufficient amplitude to break down a transistor junction but normally not destructive, may be destructive if the pulse rate frequency is great enough for them to heat up the junction. Reliability and long term stability can be improved by replacing the carbon pile regulator with a static device. A transistorized regulator does not decrease the generator transient. This transient is believed to be a function of the generator magnetic circuit. Transient suppression devices should be installed on the electronic bus. Either shunt or series devices may be used to protect the electronic bus. (Author)

United Aircraft Corp. [East Hartford, Conn.]
WIND TUNNEL TESTS OF SHROUDED PROPELLERS AT MACH NUMBERS FROM 0 TO 0.60, by Ronald M. Grose. Rept. on Contract AF 33(616)5363. Dec 58, 207p. 11 refs. WADC Technical rept. 58-604 AD-205 464.
Order from LC mi$9.30, ph$31.80 PB 154 504

This report released for sale to the public 2 Mar 61.

Wind tunnel tests were conducted by the United Aircraft Corporation Research Department to determine the aerodynamic performance of a 2.5-ft diameter shrouded propeller. The model, installed on a 12,000-rpm propeller dynamometer, was tested at Mach numbers between 0 and 0.60 and at angles of attack between 0 and 6 deg. Shroud lift and drag forces were obtained, and independent measurements of propeller thrust and torque were made with and without the shroud installed. A shroud having two leading-edge configurations was tested, one with a small lip radius to provide low drag at high flight speeds and the other with a large lip radius designed to provide high static thrust. Both shroud configurations had a ratio of chord length to propeller diameter of 0.50 and the plane of the 4-blade model propeller was located at the mid-chord of the shroud. In general, it was determined that the static thrust of a given propeller for a fixed power input can be increased as much as 65 percent by the use of a properly designed shroud. For Mach numbers below 0.30 and for high propeller power loadings, a thrust force was obtained on the shroud configuration designed for the high-speed condition. At higher Mach numbers, the performance of the propeller with the high-speed shroud configuration was inferior to that of the isolated propeller as a consequence of shroud drag. The lift of the high-speed shroud was found to be approximately the same as that of a ring wing, i.e., twice that of a simple rectangular wing having a span equal to the diameter of the shroud and a chord equal to the length of the shroud.

Vertol Aircraft Corp., Morton, Pa.
THE VERTODYNE VTOL AIRCRAFT STUDY SEMI-SPAN MODEL TESTS IN HOVERING AND FORWARD FLIGHT, by E. Brogan, G. Casey and others. Rept. on Contract Nonr-2364(00). 30 Mar 60, 106p. 13 refs. R-158; AD-234 751.
Order from LC mi$5.70, ph$16.80 PB 153 740

The Vertodyne fan-in-wing concept has been studied in a series of static and forward speed tests. A semi-span model was tested incorporating instrumentation for measuring fan thrust, torque and wing surface pressures. Forces and moments on the model were measured at the model support. Tests were performed at the University of Detroit using the available laboratory and wing tunnel facilities. Data is presented in dimensionless form which covers the forces and moments acting on the model and the fan power required for a range of static and forward flight conditions. Wing surface pressures are presented for the same range of conditions. Significant increases in wing lift accompanied by high nose-up pitching moments were obtained in forward flight. Model static thrust per horsepower was found to decrease in ground effect. A discussion of results with conclusions and recommendations for further study is included in the report. (Author)

Vertol Aircraft Corp., Morton, Pa.
WIND TUNNEL TESTS AND FURTHER ANALYSIS OF THE FLOATING WING FUEL TANKS FOR HELICOPTER RANGE EXTENSION. VOLUME I. HELICOPTER RANGE EXTENSION WIND TUNNEL STUDY, by C. B. Fay and R. B. Johnstone. Rept. on Contract DA 44-177-tc-550. Oct 60, 147p. 11 refs. R-204; TREC 60-64; AD-248 516.
Order from LC mi$7.20, ph$22.80 PB 153 879-1

A wind tunnel test has been conducted on a model helicopter fitted with floating wing fuel tanks for ferry range extension. The model consists of a tandem rotor helicopter with 3.9 ft. diameter electrically powered rotors mounted on a HUP (H-25) configured fuselage. Floating wing fuel tanks of an overall span of 4.7 ft. are attached to the fuselage through a skewed hinge. Qualitatively, the test proved the excellent behavior of the hinged wing panels at all operational speeds and attitudes, in and out of ground effect. Quantitatively, the results show that: (1) The effect on induced power on the front and rear rotor due to the presence of the fuel wing was of the same magnitude as that predicted in the theoretical analysis and in the feasibility study. (2) The stability characteristics of the fuel-wing were better than that predicted, which, in turn, will improve the stability and dynamic characteristics of the total system. (3) The trajectory of the jettisoned wing panel was below the helicopter rotors, which is required if jettisoning the wing is to be used in the event of an emergency. (Author)

Vertol Aircraft Corp., Morton, Pa.
WIND TUNNEL TESTS AND FURTHER ANALYSIS OF THE FLOATING WING FUEL TANKS FOR HELICOPTER RANGE EXTENSION. VOLUME 2. GROUND AND AIR MECHANICAL INSTABILITY ANALYSIS, by V. Capurso, R. Ricks and R. Gabel. Rept. on Contract DA 44-177-tc-550. Oct 60, 225p. 14 refs. R-197; TREC 60-65; AD-248 517.
Order from LC mi$9.90, ph$34.80 PB 153 879-2

Mechanical instability of a helicopter range extension system utilizing hinged wing fuel tanks has been investigated for acceptable characteristics on ground and in the air. Ground instability is studied for the H-21, H-25, and H-34 helicopters with wing tanks through a simulated takeoff with full tanks to a landing with empty tanks. Instability ranges appear due to antisymmetric blade lag motions coupling with aircraft roll and lateral motions and wing flap and bending modes. Critical conditions are in the roll mode in takeoff with full tanks and in landing with empty tanks, but damping from the helicopter and wing oleo struts is always sufficient to control the instability. (Author) (See also PB 153 879-1)

Chemical Engineering

Advanced Metals Research Corp., Somerville, Mass.
A METHOD FOR IDENTIFICATION OF STRATOSPHERIC PARTICLES, by R. Lewis, S. Moll and others. Rept. on Contract AF 19(604)4146. 30 Sep 60, 74p. 1 ref. Research rept. AMR 1005; AFCRL-TR-60-419; AD-248 133.
Order from LC mi$4.50, ph$12.30 PB 153 653

Standard x-ray fluorescent techniques proved applicable for analyzing only microgram quantities of material. An x-ray micro-fluorescent technique was developed capable of analyzing minute deposits on formvar films. Detectability limits were of the order of 10^{-9} grams. Electron beam microanalysis proved to be an applicable method which combined good accuracy and high resolution. Analysis of a number of balloon flight and high altitude aircraft collected samples indicate that sulfur, probably present as a sulfate, may be the most important constituent of stratospheric aerosols. Smaller but positive amounts of silicon, aluminum, and iron were also present in the collections. The presence of calcium, magnesium, chlorine, phosphorous, vanadium, titanium and nickel were detected in isolated cases but their inclusion as constituents of stratospheric aerosols is debatable.

Naval Engineering Experiment Station, Annapolis, Md.
DECARBONATION OF SEA WATER FOR EVAPORATOR SCALE CONTROL, by J. R. Belt. [1950] 26p. 2 refs. E.E.S. rept. 1A66024.
Order from LC mi$2.70, ph$4.80 PB 154 746

This report released for sale to the public 15 Mar 61.

A method for prevention of scale in low-pressure distilling plants by removal of the carbon-dioxide content of the sea-water feed has been proposed by Armour Research Foundation. This consists of thermal decomposition of the carbonate and bicarbonate ions present and subsequent stripping of the carbon dioxide from the water by aeration. The completeness of the reaction at moderate temperature is predicated upon the buffering action of magnesium ions in alkaline sea water. An investigation at Fort Story, Virginia, using full-scale equipment, showed that the reaction described does not proceed to the predicted extent at moderate temperature and that the degree of decarbonation possible with feasible equipment is of no value in scale reduction. (Author)

Civil Engineering

Army Snow Ice and Permafrost Research Establishment, Wilmette, Ill.
CUT-AND-COVER TRENCHING IN SNOW, by R. W. Waterhouse. July 60, 15p. Technical rept. 76.
Order from LC mi$2.40, ph$3.30 PB 153 556

A method developed and tested in Greenland in 1955 and 1956 for making covered trenches in snow for use as subsurface shelters and communication-ways in the Ice Cap is described. The machine used for trench-cutting and roof-forming operations was a Peter snow miller. The initial installation consisted of a trench 8 ft wide and 10 ft deep with a 2-ft shoulder on each side, over which an arched snow cover was formed on a removable steel form system. During initial stripping, considerable shock and multilation could be sustained by the snow seat and the filled arch without apparent damage to the roof system. The form system was easy to handle with a min. of instruction. A covered trench of 500 ft was constructed and instrumented to gage the time deformation and closure rate. Experience has proved that the method used is sound and practical. Undershow facilities of significant size and durability may be produced quickly by service personnel. A sequence of photographs is included showing details of the construction techniques, and data on arch-form details are appended. (Author)

Columbia U., New York.
INEQUALITIES FOR FIRST EMPTINESS PROBABILITIES OF A DAM WITH ORDERED INPUT, by R. Pyke and J. Gani (Stanford U.). Rept. on Contract Nonr-266(59) and NSF Grant 9670. [1960] 23p. 4 refs. CU-17-60-Nonr-266(59)MS; AD-236 737.
Order from LC mi$2.70, ph$4.80 PB 147 546

Probabilities of first emptiness times for a dam fed by certain ordered inputs $a_1, \ldots, a_p$, and subject to a steady release rule are considered. The unwieldy equations for these probabilities restrict their usefulness, and simple inequalities are derived for them which prove more tractable in practice. These are applied to the particular case of the dam with two ordered Poisson inputs a_1, a_2, the exact probabilities of first emptiness and their upper and lower bounds being compared for various values of the parameters involved. Conditions for the probability that the dam will eventually become empty are presented. (Author)

Electrical and Electronic Engineering

[Aerial Reconnaissance] Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
ALTERNATING-TRACK COUNTER-ROTATION RECORDER FOR MAGNETIC RECORDING, by Charles Colbert and William G. Stryker. Rept. on Automatic Recorder for Electronic Countermeasures Equipment. June 52, 48p. 2 refs. WADC Technical rept. 52-2; ATI-162 940.
Order from LC mi$3.30, ph$7.80 PB 154 296

This report released for sale to the public 6 Mar 61.

In the storage of intelligence for later reproduction, it is important that (1) the greatest amount of intelligence be stored in the smallest amount of space, (2) the reproduction be of acceptable quality, and (3) editing be facilitated. To this end, a magnetic recorder (Altracor) utilizing several parallel recording paths on the magnetic tape was designed, wherein the recording elements are in motion in a direction opposite to that of the tape. Significant features of the laboratory model are presented. A theoretical treatment of this recording scheme is also presented. It is concluded that application of the Altracor principle will provide a recorder which, for many applications, will allow better utilization of the available magnetic-tape storage volume. (Author)

Airborne Instruments Lab., Deer Park, N. Y.
RADIO DOPPLER DETECTORS FOR AIRPORT GROUND TRAFFIC CONTROL, by J. C. O'Connor, J. B. Leary and D. J. Greber. Rept. on Contract FAA/BRD-53. June 60, 72p. Rept. no. 5934-1.
Order from OTS $2.00 PB 171 509

This report describes the investigation of a radio doppler detector as a boundary-crossing sensor for purposes of airport ground traffic control. It is capable of detecting surface traffic and airborne traffic in the approach zone and over the runways of an airport. This program developed and delivered 22 doppler detectors for approach-zone, runway, and taxiway detection capable of showing detection, location, and direction of travel of vehicles and aircraft on the instrumented areas of NAFEC. (Author)

Airborne Instruments Lab., Melville, N. Y.
TRANSISTORIZED MTI CANCELER, by C. J. Meiselbach. Final engineering rept. on Contract AF 30(602)1750. 22 Aug 59, 29p. 6 refs. Rept. no. 4520-1; RADC-TR-59-220; AD-230 992.
Order from LC mi$2.70, ph$4.80 PB 153 888

An engineering model of MTI Group AN/GPA-( ) [Transistorized MTI Canceler] will demonstrate the feasibility of manufacturing transistorized and miniaturized cancellation equipment with electrical performance characteristics comparable with those of tube equipment. The engineering model is 0.75 cubic foot in volume, is completely transistorized (using 91 transistors) and operates on about 10 watts of power. A miniaturized 2778-μsec folded ultrasonic delay line mounted in a temperature-controlled oven is used to determine the system PRF. This delay line is approximately one-half the diameter of a conventional delay line. The high-quality performance of this delay line verifies the practicability of the folded type of construction. The Canceler includes automatic pulse amplitude and timing circuits that maintain a cancellation ratio in excess of 36 db for extended periods. The Canceler operates satisfactorily over a temperature range of 40 C (from +5 C to +45C). This performance is achieved using germanium transistors without elaborate temperature-compensating devices. A smaller unit, meeting stricter temperature requirements appeared completely feasible using the improved transistors and components now available. (Author)

Airborne Instruments Lab., Mineola, N. Y.
CONSTRUCTION OF BEACON VIDEO DEFRUITING EQUIPMENT TYPE 2.3NS10, by P. G. Holcombe. Final engineering rept. on Contract FAA/BRD-76. Apr 59, 40p. 1 ref. Rept. no. 4614-1.
Order from OTS $1.00 PB 171 508

In a dense air traffic environment many nonsynchronous beacon replies are generated. These replies or "fruit" clutter the PPI display and thereby mask true or synchronous beacon replies. Beacon Video Defruiting Equipment 2.3NS10 was designed to eliminate the fruit or unwanted replies without deterioration of the synchronous replies. This report describes the defruiting equipment and the associated design problems encountered. (Author)

Airborne Instruments Lab., Mineola, N. Y.
DEVELOPMENT OF ANDB TYPE 2.3NS9 BEACON VIDEO STORAGE-TUBE DEFRUITING EQUIPMENT, by W. Smith. Final engineering rept. on Contract NOas 57-405-c. Mar 59, 85p. Rept. no. 3689-1.
Order from OTS $2.25 PB 171 504

This equipment is a part of the ANDB Type III Air Traffic Control Radar Beacon System (ATCRBS) and is designed to eliminate random asynchronous replies from the beacon display. In system operation, a beacon interrogator-responder (IR) unit transmits a series of paired pulses at the radar PRF (or a submultiple frequency) that are received at an airborne transponder. In the present system, the transponder replies with a train of from two to eight pulses having a nominal pulse duration of 0.45 μsec. The first and last pulses (bracket pulses) of the reply train are spaced 20.3 μsec apart. Coded information pulses may occupy any assigned intermediate pulse position, the spacing between adjacent pulse positions being 2.9 μsec. Future system operation will include up to 13 information pulses spaced 1.45 μsec apart. (Author)

Armour Research Foundation, Chicago, Ill.
HIGH POWER TRANSDUCERS, by H. B. Karplus and R. R. Whymark. Quarterly rept. no. 4, 15 Feb-15 May 60, on Contract Nonr-2900(00). [1960] 3p. ARF-1149-4.
Order from LC mi$1.80, ph$1.80 PB 147 498

The detailed study of the relation of magnetic and motional parameters of nickel strips and stacks has continued for both the quasi-static and the dynamic (resonant) conditions.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
APPLICATION OF MASER TO NUCLEAR/WEATHER SURVEILLANCE RADAR, by Raymond L. Robbiani. 15 Sep 60, 16p. USASRDL Technical rept. 2151; AD-244 752.
Order from LC mi$2.40, ph$3.30 PB 153 250

A bench test, performed to determine the increase in sensitivity that an X-band helium MASER could afford a Radar Set AN/CPS-9 receiver, indicated an average improvement of 20 db in receiver sensitivity. Assuming an input antenna noise of 290°K, the receiver sensitivity improvement to be expected from an operating radar equipment was calculated to be approximately 12.5 db. The MASER was tested in a Radar Set AN/CPS-9 to determine the effect of the transmitted energy on the MASER's amplification. The MASER was completely saturated by the transmitted pulse. In an effort to reduce the MASER saturation, a fixed, two-dish vertically directed antenna system was assembled. Even when the two-dish system was operated with the antennas 300 ft apart, the MASER was completely saturated. Radar sensitivity improvement opens many prospects for future uses of X-band radars. These include improvement in nuclear-weather surveillance, improved meteorological intelligence, satellite operations, etc. The new, much smaller MASER, which uses liquid nitrogen instead of liquid helium, may lend itself more readily to inclusion in tactical-type radar equipments. A calculated comparison of a parametric amplifier and the MASER shows the MASER to have a 15-db advantage in sensitivity if antenna noise is ignored, and at least a 5.7-db advantage if a 290°K antenna noise is assumed. (Author)

Army Signal [Research and Development Lab.] Fort Monmouth, N. J.
A HIGH VOLTAGE COAXIAL CABLE CONNECTOR FOR RADAR SET AN/TPS-1D, by William E. Mayo. 30 Dec 57, 17p. 2 refs. Technical memo. no. M-1926; AD-160 055.
Order from LC mi$2.40, ph$3.30 PB 153 248

An improved version of connector adaptor assembly (CG-900( )/U was designed which will meet the requirements for use in radar equipment AN/TPS-1D. The newly designed connector, when assembled to a length of RG-19/U cable without the use of DC-4 high voltage grease, was found to have a 60-c corona extinction voltage of 10,500 (RMS). With the application of DC-4, the voltage level was increased to 12,500 v (RMS). The VSWR of 2 connectors attached to an 8 ft. length of RG-19/U cable was less than 1.15 over the required frequency band. The VSWR of the individual connector is estimated to be below 1.08 and the connector should be capable of handling peak pulse power levels in the order of 500 kw without failure.

Army Signal [Research and Development Lab.] Fort Monmouth, N. J.
A NOVEL ANTENNA FOR MOBILE RADIO RELAY OPERATION IN THE UHF RANGE, by Frank J. Triolo. Nov 57, 28p. 4 refs. Technical memo. no. M-1924; AD-160 061.
Order from LC mi$2.70, ph$4.80 PB 153 247

A novel type antenna configuration called the Double-Rhombic was designed and constructed for use in the frequency range from 400 to 600 mc. This configuration is formed by combining 2 rhombic antennas whose planes form an angle with each other and which have a common diagonal. The input and output terminals of both rhombics are connected in parallel with each other. A 60° angle between planes was optimum on the basis of full scale radiation pattern measurements. The antenna is capable of handling approximately 100 watts of power. Its gain compared to the standard Radio Relay Set Band "D" dipole array varies from -2 to +2.5 db over the frequency band. The SWR was found to be less than 1.4 to 1. The antenna is so mechanically designed that it is relatively light in view of its fairly large dimensions, being in the order of 25 lbs. It is constructed of thin-walled aluminum tubing and employs girder-type support in its fabrication. It has a very low wind drag when compared to other antennas utilized in the same range. The antenna is capable of being assembled and disassembled in a very short time, and therefore is very attractive for use in military applications for mobile radio relay operation in the UHF frequency range.

Army Signal [Research and Development Lab.] Fort Monmouth, N. J.
A VERNIER TIME INTERVAL MEASURING SYSTEM, by Herbert D. Tanzman. 26 Feb 58, 32p. 2 refs. Technical memo. no. M-1948; AD-160 057.
Order from LC mi$3.00, ph$6.30 PB 153 249

As a result of the investigation of time measuring equipment, a system has been produced which will precisely measure time intervals between two pulses. The system consists of two pulsed crystal ringing oscillators, a coincidence detector, several gates, and flip-flops, and two electronic counters that accurately display the time difference between the start and stop pulses and the coincidence pulse. The system works satisfactorily for time intervals having a range of 0.9 to 1000 μsec. All component assemblies are commercially available with the exception of the pulsed crystal ring oscillators and the coincidence detector, which were designed by the Frequency Control Branch. (Author)

Battelle Memorial Inst., Columbus, Ohio.
THERMOELECTRIC PROPERTIES OF Bi_2Te_3 - Bi_2Se_3 ALLOYS, by R. T. Bate. Technical rept. no. 3 on Contract Nonr-2316(00). 15 Mar 60, 10p. 5 refs. AD-233 625.
Order from LC mi$1.80, ph$1.80 PB 153 753

Thermoelectric properties of Bi_2Te_3-Bi_2Se alloys were studied in the lower temperature region. A technique used by Putley (Proc. Phys. Soc. (London), 68B:35, 1955) and by Harman, Cohn, and Logan (J. Appl. Phys. 30:1351, 1959) was used. In this technique, the sample is suspended by fine current leads in an evacuated can. When current passes through the sample, a temperature gradient develops across it because the Peltier heat is absorbed at one end and liberated at the other. This gradient builds up until the rate of evolution and absorption of heat by the Peltier effect is balanced by conduction back through the sample and out through the leads, and by exchange of heat by radiation between the can and the sample. Since the temperature gradient produces a Seebeck potential, the voltage across the sample increases until the steady-state condition is reached. Isothermal resistivity vs temperature data for p-type Bi_2Te_3, n-type Bi_2Te_3-Bi_2Se_3, and commercial n-type Bi_2Te_3 alloys were plotted. The temperature dependence of the resistivity of the alloys was similar at high temperatures while that of the p-type Bi_2Te_3 was steeper. Figure of merit ($\alpha^2/\kappa\rho_i$, where α is the absolute thermoelectric power, κ is the thermal conductivity, and ρ_i is the isothermal resistivity) vs temperature was plotted; a decrease in Z with decreasing temperature was shown. A plot of temperature dependence of thermal conductivity showed that the commercial alloy was independent of temperature at low temperatures. Bi_2Te_3-Bi_2Se_3 alloys went through a broad maximum, and Bi_2Te_3 increased roughly as 1/T.

Boston Coll., Chestnut Hill, Mass.
RESEARCH DIRECTED TOWARD THE DEVELOPMENT OF A PULSED AIR-CORE BETATRON, by William G. Guindon. Scientific rept. on Contract [AF 19(604)2195]. 19 Sep 60, 47p. 4 refs. AFCRL TN-60-822. AD-248 588.
Order from LC mi$3.30, ph$7.80 PB 153 822

The equations of motion of an electron in a cylindrically symmetric changing magnetic field are analyzed with a view to displaying the conditions for betatron acceleration and focussing of a betatron beam. Details are given of a 36-kilojoule capacitor bank and related switching apparatus which were designed primarily for powering a pulsed air-core betatron. A series of models of betatron coil configurations is described, together with the method and results of

measuring their magnetic field distributions. Full-scale tests of a model that appeared likely to satisfy the conditions for betatron operation proved unsuccessful. In a discussion of the results of these tests, suggestions are given for further theoretical analysis and for experimental refinements of the apparatus. (Author)

Brown U. Div. of Applied Mathematics, Providence, R. I.
APPROXIMATE DISTRIBUTIONS OF NOISE POWER MEASUREMENTS, by Walter Freiberger and Ulf Grenander. Technical rept. no. 2 on Contract DA 36-039-sc-78130. Oct 58, 26p. 5 refs. Rept. DA-SC-78130/2; AD-208 225.
Order from LC mi$2.70, ph$4.80 PB 153 599

The frequency functions of certain spectral estimates are studied analytically and numerically. An approximation is obtained for the case of a Poisson weight function and compared to the true distribution. The eigenvalues of products of Toeplitz matrices play a crucial role in the sampling theory of quadratic forms; an approximation to their distribution is discussed and its accuracy studied numerically. This leads to approximate probability densities which are thought to be valid for moderate or even small sample sizes. (Author)

California U., Los Angeles.
ON MINIMUM OF MAXIMUM EXPECTED DEVIATION FROM AN UNSTABLE EQUILIBRIUM POSITION OF A RANDOMLY PERTURBED CONTROL SYSTEM, by Masanao Aoki. Rept. on Contract Nonr-233(52). May 60, 36p. 15 refs. Dept. of Engineering rept. no. 60-42; AD-239 942.
Order from LC mi$3.00, ph$6.30 PB 149 090

A sequence of optimal control variables (an optimal policy) is determined, and how such an optimal policy depends on the choice of the performance-criterion functions is investigated. The switching boundaries for minimizing the maximum expected deviation in N control stages are shown to be different from those for minimizing the mean of final deviation. The effectiveness of such an optimal policy when only partial information is given on the random variable disturbing the system is discussed. The performance of a certain sub-optimal policy is also described. (Author)

Carnegie Inst. of Tech., Pittsburgh, Pa.
ELECTROMAGNETIC PROPERTIES OF INSULATORS FROM A MANY-PARTICLE POINT OF VIEW, by Vinay Ambegaokar. Doctoral thesis. Technical rept. no. 12 on Contract Nonr-760(13). Mar 60, 85p. 40 refs. AD-234 927.
Order from LC mi$4.80, ph$13.80 PB 153 776

A discussion is presented, from a many particle point of view, of the response of insulators to weak long-wavelength electromagnetic fields. The model consists of a lattice of nuclei (supposed rigid and of cubic symmetry) and electrons which interact with these nuclei as well as with each other. The Coulomb interactions between the electrons are allowed for to all orders of perturbation theory, and Feynman graphs are introduced to describe the terms of the perturbation series. The perfect insulator is treated and results show that the response of this many particle system to long wavelength electric fields of arbitrary polarization is exactly contained in a single frequency-dependent dielectric constant. In the limit of long wavelengths and low frequencies, the effects of an external magnetic field are included on the system. A discussion of the system of insulator plus one electron is given using methods similar to those applied to the perfect insulator. The true effective mass, m^*, of the extra particle is defined as the curvature in wave-vector space of the energy surface connecting the many particle ground state and the low-lying excited states. The central result obtained is that the response of the system to weak long wavelength, low frequency electric fields is exactly that of a single particle of effective mass m^* moving in a medium characterized by the dielectric constant of the perfect insulator. The effective mass picture of the response is thus shown to be exact when one extra electron is added to the insulator and consequently very nearly exact when a few particles are present. (Author)

Carnegie Inst. of Tech., Pittsburgh, Pa.
A STUDY OF TEM POWER TRANSMISSION, by Frederick J. Young, Keith Soo Hoo, and Juda L. Shohet. Rept. for Sep 59-Aug 60 on Contract AF 33(616)6760. Sep 60, 97p. 43 refs. WADD Technical rept. 60-691.
Order from OTS $2.25 PB 171 498

Means of increasing the power carrying capacity of coaxial transmission lines are sought. A multiconductor system is devised which can handle about twice the power per cross sectional area of conductor than an ordinary coaxial conductor. This configuration comprising several concentric conductors is most useful at frequencies where dielectric breakdown limits the maximum power handled. In cases where the limiting factor is dielectric hot spot temperature a three conductor line is optimized to yield a promising improvement over ordinary structures. Both lines devised are inherently low impedance structures and must be matched by tapered transmission lines. A field theory solution to the tapered transmission line problem is presented. Expressions relating the tapered line geometry to the impedance transformation ratios are derived. (Author)

Centre de Physique Electronique et Corpusculaire (France).
WIDE DYNAMIC RANGE BARRIER GRID STORAGE TUBE T. C. M. 16, by G. Wendt. Quarterly rept. no. 3 on Contract N62558-2275. 1 Mar 60, 44p. WR. 505; AD-234 831.
Order from LC mi$3.30, ph$7.80 PB 153 809

Contents:
Some general characteristics of the TCM 16 storage tube
Ion spot
Distortion of the output signal base by the secondaries issued by the neck of the tube
Resolution curves corresponding to two possible focusings
Attempts to improve the gun of the TCM
Study of the behavior of the target

Decrease of the output signal with an increase of the backplate bias
Garland shaped shading
Influence of the number of writings on the output signal
TCM 17 tube
TCM 14 tubes with a 40 mesh per millimeter storage grid
(See also PB 152 092)

Centre de Physique Electronique et Corpusculaire (France).
WIDE DYNAMIC RANGE BARRIER GRID STORAGE TUBE T.C.M. 16[17] by G. Wendt. Quarterly rept. no. 4 on Contract N62558-2275. 31 May 60, 17p. W.R. 535; AD-238 983.
Order from LC mi$2.40, ph$3.30 PB 148 656

During the last quarter the behaviour of tube TCM 17 and its gun was examined. In this tube the beam was modulated by the application of the input signal to an arrangement of deflection plates. The proportionality between the beam current and the modulating voltage was very satisfactory. The correction for field curvature and astigmatism was carried out as in tube TCM 14-J. When the beam current was modified, a slight shift of the spot was observed on the target. This shift was measured by means of a special tube. It was of the order of 0.1 mm and depended on the ratio of the modulating voltages applied to plates 11 and 12 of the modulator system. The influence of this shift and of a certain amount of spot defocusing near the cut-off voltage on the amplitude of the output signal, as well as on the resolution, was examined with a complete TCM 17 tube. A lowering of this amplitude below the value required was observed for small values of the writing current. The behaviour of the target in TCM 17 was about the same as in TCM 16. Shading in the X direction was slightly different. It was concluded that the present gun for the TCM 17 was not yet quite suitable for mounting in a memory tube which required a linear response. It should be capable of improvement after further development. (Author) (See also PB 152 092)

Clevite Research Center, Cleveland, Ohio.
RESEARCH AND DEVELOPMENT OF ULTRA-HIGH-TEMPERATURE DIELECTRIC MATERIALS FOR CAPACITORS, by John Koenig. Quarterly rept. no. 2, 1 Aug-31 Oct 58, on Contract NObs-72404. 17 Nov 58, 22p. 6 refs.
Order from LC mi$2.70, ph$4.80 PB 154 541

This report released for sale to the public 2 Mar 61.

Ceramic discs of $BaZrO_3$, $La_2Ti_2O_7$ with and without some partial cation substitutions, $LaAlO_3$, $ZrTiO_4$ and $LaNbO_4$ were prepared. X-ray diffraction patterns indicate that almost every composition was single-phase. Up to 500°C, dc-resistivity and dielectric constant, and dielectric quality factor at 1 Mc were measured. The dielectric constant and quality factor were determined at room temperature at 1 Mc and 100 Kc as well. $BaZrO_3$ modified by La_2O_3 and $La_2Ti_2O_7$ modified by Nb_2O_5 approach contract requirements in the properties evaluated so far. At 300°C resistivities are between 10^8 - 10^9 Ω-m and quality factors in the neighborhood of 1000. Room temperature dielectric constants are about 30 and 50 respectively changing not more than 10% up to 500°C. (Author)

Columbia U. School of Engineering, New York.
EXPONENTIAL DETECTORS, by Christopher Kaiteris. Technical rept. T-2/M on Contract Nonr-266(60). 1 Mar 60, 27p. 6 refs. CU-8-60-Nonr-266(60)-EE; AD-235 778.
Order from LC mi$2.70, ph$4.80 PB 153 736

Semiconductor diodes are used extensively to generate nonlinear functions by piecewise linear approximation. The voltage-current relationship for these diodes is of an exponential form. If a semiconductor diode is used in conjunction with other circuit elements, the characteristics of the circuit will differ from what would be obtained by using an "ideal" diode This difference is greatest when the input signals are small and the diodes are unbiased. It is important to determine the effect of the exponential diode relationship on the output signal to noise ratio of circuits using diodes. A good idea of the effect of the exponential diode characteristic is obtained from a study of the signal to noise ratio of the diode current which results from a signal plus noise voltage applied to the diode. A detector formed by following the diode with a low pass filter is similarly analyzed. The results are compared to those for a square law device and the effect of an exponential transfer function is discussed. (Author)

Cornell U., Ithaca, N. Y.
A STUDY OF THE THERMIONIC POINT FILAMENT ELECTRON GUN, by Malcolm Richard Specht. Technical rept. no. 18 on Theoretical and Experimental Investigations of the Atomic Phenomena Occurring on and Near the Surfaces of Solids, Contract AF 18(600)674. 1 July 60, 92p. 17 refs. AFOSR TN-60-756.
Order from LC mi$5.40, ph$15.30 PB 153 830

The brightness and diameter of the effective electron source produced by thermionic point filaments of 3μ, 2μ, and 1μ radii of curvature have been determined as functions of the bias voltage. The peak brightness is found to vary between 48% and 78% of the theoretical maximum value expressed by Langmuir's formula. The most significant result found in this experiment is that a minimum source diameter of about 8μ can be obtained with a point filament. The results of this investigation of the point filament electron gun indicate that this type of gun might advantageously be employed in electron microscopes and electron diffraction cameras when the need for a smaller effective source is sufficiently great to justify the additional time and care required to manufacture and properly align the point filament.

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
THE MEASUREMENT OF CATHODE RESISTANCE USING RETARDING AND ACCELERATING FIELDS, by Eugene George Todd. Master's thesis. Technical rept. no. 37 on Contract DA 36-039-sc-64646. 15 Aug 58, 51p. 6 refs. Research rept. EE 401; AD-202 672.
Order from LC mi$3.60, ph$9.30 PB 154 420

Two methods for measuring cathode resistance under CW conditions are described. In the first a movable

anode diode is used to obtain the voltage drop across the cathode coating. Measurements are taken by placing an accelerating field on the plate of the tube. The second method is used on a conventional parallel plane-type triode vacuum tube. Cathode resistance measurements are taken by placing a retarding field on the plate of the tube. In both methods, the voltage drop across the cathode coating is measured. From knowledge of the emission current, the cathode resistance is then calculated. These methods, therefore, measure the total cathode resistance offered to the d-c emission current. (Author)(Also included in PB 145 472)

David Sarnoff Research Center, Princeton, N. J.
METEOR FACSIMILE VIA METEOR TRAIL PROPAGATION. Final rept. on Contract AF 19(604)4102. 19 Aug 60, 118p. 20 refs. AFCRL-TR-60-190.
Order from LC mi$6.00, ph$18.30 PB 153 818

A meteor propagation research study was initiated to determine the relationship of bandwidth, system gain, duty cycle and the picture quality for the graphic transmission of information over ionized meteor trails. Terminal instrumentation was developed to transmit and receive facsimile by meteor burst propagation over a 910 mile path on frequencies of 40.0 and 49.72 mcs. At the transmitter, printed text and other test patterns were scanned at the rate of two complete frames per second. At the receiver, an electronic facsimile system recorded a picture when the received signal rose above a pre-set threshold. Tests were conducted at r-f bandwidths of 27, 55, 110, and 220 kc/s, with maximum keying rates of 41,000, 92,000, 164,000, and 370,000 binary bits per second, respectively. The occurrence of multipath delay was relatively rare, and measured values were in the microsecond range. Duty cycle varied over a wide range, depending on threshold, time of day, and transmitter power. Average information-handling capability was 2300 binary bits per second on 220 kc/s bandwidth and 1400 binary bits per second on 110 kc/s bandwidth, in the early morning. The larger rate with wider bandwidth indicates the propagation medium is not a limiting factor in achieving higher transmission rates. The synchronous system, employing synchronous horizontal sweeps at each terminal provided a tool for measuring relative transit time of individual meteor bursts, and improved the facsimile quality by maintaining scanning synchronism independent of signal level. (Author)

David Sarnoff Research Center, Princeton, N. J.
RESEARCH AND DEVELOPMENT ON SEMICONDUCTOR PARAMETRIC AMPLIFIERS, by K. K. N. Chang, H. J. Prager and others. Scientific rept. no. 1, 1 Jan 59-31 Aug 60 on Contract AF 19(604)4980. 31 Aug 60, 91p. 22 refs.
Order from LC mi$5.40, ph$15.30 PB 153 268

p-n junction diodes were designed which are not conventionally mounted or wired. Instead, individual units of p-n junctions are attached directly to a non-dispersive slow-wave structure such as a helix. By carefully mounting three individual parametric diodes on the helix turns, net power gains of 26 db have been obtained. Noise factors of 5 to 7 db were measured. An improved version of an helix type amplifier using 18 distributed parametric diodes has achieved bandwidths of the order of 200 mc. Work on low-frequency pumping was also extended to an investigation of the possibility of harmonic generation of millimeter waves using nonlinear reactances. The introduction of tunnel diodes prompted an investigation of a new set of semiconductor microwave amplifiers and frequency converters with a D.C. pump. A tunnel diode amplifier was first investigated. The expressions for gain, bandwidth and noise factor of this amplifier are shown to be analogous to those found for a cavity-type parametric amplifier with one striking difference, the bandwidth of the tunnel diode amplifier is comparatively broad. The noise in the tunnel diode was found to be essentially of the shot-effect type. When the tunnel diode amplifier operates at infinite gain, oscillation takes place. A simple theory for a tunnel diode oscillator was derived. In addition to amplifiers and oscillators, tunnel diodes can be used as frequency converters. The unusual I-V characteristic of tunnel diodes suggested a down converter which can exhibit both conversion gain and low noise factor. Parametric and tunnel diodes are both two-terminal devices. To achieve four-terminal amplifiers with these devices, a traveling-wave scheme using a series of distributed diodes has been suggested.

Digital Computer Lab., U. of Illinois, Urbana.
A THEORY OF ASYNCHRONOUS CIRCUITS III, by W. Scott Bartky. Rept. on Contract Nonr-1834(27). 6 Jan 60, 53p. Rept. no. 96.
Order from LC mi$3.60, ph$9.30 PB 152 915

Contents:
Section 11. Cycling in distributive circuits
Section 12. A general synthesis procedure

Dunham Lab., Yale U., New Haven, Conn.
MAGNETIC PHASE CORRECTION CIRCUITS, by Richard Clark Barker and Algirdas J. Gruodis. Rept. on Contract AF 33(616)5018. Mar 60, 136p. 15 refs. WADC Technical rept. 59-237; AD-238 049.
Order from OTS $2.75 PB 171 542

The objective of this work was to do research and development on techniques for integration and differentiation of the modulation on suppressed-carrier signals, using solid state and magnetic components. All of the techniques developed make use of saturable magnetic cores, because they lend themselves to both long and short range storage of electrical signals, a function necessary in any system having other than a flat frequency response. Specifically, circuits have been developed which differentiate and integrate the modulation on a suppressed-carrier signal by, respectively, taking finite differences and by accumulation. Also, techniques are discussed for altering magnetic amplifier design to produce integration and differentiation. In all cases the emphasis has been placed upon the basic theory of operation rather than design for particular specifications. It has been shown that the different types of integrators and differentiators have many basic features in common, and recognition of these basic features is essential to the full exploitation of these circuit techniques. (Author)

Dunlap and Associates, Inc., Stamford, Conn.
DEVELOPING AND TESTING THE EFFECTIVENESS OF THE "PREDICTOR INSTRUMENT", by Charles R. Kelley. Rept. on Contract Nonr-2822(00). 7 Mar 60, 31p. 3 refs. Technical rept. 252-60-1; AD-234 494.
Order from LC mi$3.00, ph$6.30 PB 153 758

The predictor instrument is a newly invented display for use in manual control systems. The purpose of the present study was to develop further and to test the predictor instrument as an aid to manual control. The project is concerned with 4 problems: (1) the effect of simplifying the fast-time simulation which comprises the heart of the predictor display; (2) the effect of changes in the time span for which a prediction is made; (3) the effect of changing the program of the predictor instrument, which is based on assumptions made about the future position of the operator's control; and (4) determination of ways of coding three dimensions of information into the cathode ray tube type predictor display. Research so far completed was principally concentrated on the second and third of these problems, which have proved to be the easiest to equip for. Although the predictor instrument has many other applications, research so far was concentrated on vehicular control systems. It was for the most part, limited to cathode ray tube display configurations in which one or more traces are shown to represent predicted system output from present time continuously to a point in the future. (Author)

Eitel-McCullough, Inc., San Carlos, Calif.
CERAMIC TUBES DEVELOPMENT FOR EXTERNAL HEAT SOURCES, by John F. Richter. Rept. for 8 June 59-7 June 60 on Receiving Tubes, Contract AF 33(600)39665. June 60, 43p. 6 refs. WADD Technical rept. 60-565.
Order from OTS $1.25 PB 171 492

The material, design, and processing problems associated with the development of an electron tube structure capable of sustained operation by means of an external radioisotope heat source are discussed. The adaptation of an existing ceramic-metal, planar structure for use with an existing polonium 210 heat source in a proof-of-principle device is described, and performance of this device during and after its successful demonstration is reported. The limitations of the planar structure are discussed and design experiments utilizing a cylindrical structure with an electroformed cathode, are described. Affirmative conclusions are drawn as to the feasibility of the cylindrical structure. On this basis, recommendation is made to utilize the cylindrical structure as the basis for development of a practical tube. (Author).

Electronics Research Lab., U. of California, Berkeley.
NOISE IN CROSS-FIELD ELECTRON BEAMS, by T. Van Duzer. Rept. on Contract DA 36-039-sc-85278. 23 May 60, 207p. 65 refs. Series no. 60, issue no. 280; AD-245 161.
Order from LC mi$9.30, ph$31.80 PB 153 937

Microwave amplifiers and oscillators employing electron streams which move through mutually perpendicular electric and magnetic fields have been found to have characteristically large outputs of broad-band noise power. The present investigation concerns the causes of the noise. Particular emphasis is placed on the behavior of the stream in the electron-gun region. A method of measuring the velocity distribution in an accelerating crossed-field beam was devised and applied to the study of a beam in a simple gun. An analysis of the high-frequency behavior of the crossed-field potential-minimum was performed to study the effect of the magnetic field. The propagation of current and velocity fluctuations along accelerating crossed-field streams was studied theoretically. (Author)

Electronics Research Lab., U. of California, Berkeley.
STUDY OF CROSSED-FIELD AMPLIFIERS, by J. R. Whinnery, C. K. Birdsall and others. Quarterly progress rept. no. 2, 1 May-31 July 60, on Contract DA 36-039-sc-85278. [1960] 23p. 12 refs. AD-245 160.
Order from LC mi$2.70, ph$4.80 PB 153 938

Changes were made in the single-anode velocity analyzer to increase the accuracy of velocity distribution measurements at the inner edge of the beam and also to facilitate measurement of noise current in samples across the beam. Diocotron gain in the gun region is discussed; an approximate calculation of noise figure for a crossed-field amplifier is presented. A noise figure of 20 db is obtained in a particular case. Electron trajectories in a crossed-field potential minimum are calculated with and without time-varying perturbation of the static potential. Electrons can be trapped at the minimum for special conditions on the perturbation. (Author) (See also PB 152 562)

Engineering Research Associates, Inc., St. Paul, Minn.
STATIC READING OF MAGNETICALLY STORED DIGITAL INFORMATION, by S. M. Rubens. Rept. on Contract NObsr-42001. 21 Aug 51, 34p. 1 ref. PX 29501.
Order from LC mi$3.00, ph$6.30 PB 154 747

This report released for sale to the public 16 Mar 61.

It has been demonstrated that the harmonically-variable reluctometer type of static reading device can be used satisfactorily to read magnetically-recorded binary digital information. With the circuits developed in this investigation, the device operates successfully and reliably for reading in contact records of 100 bits per inch or less (recorded in contact) so long as the equipment is in continual readiness for use (tubes "warmed up").

General Telephone and Electronics Labs., Inc., Bayside, N. Y.
STUDIES OF ELECTRON TUBE MATERIALS AND THERMIONIC EMISSION PROCESSES. Scientific rept. no. 1 for 1 Apr-30 June 60 on Contract AF 19(604)7286; Continuation of Ultrapure Nickel Studies, Contract AF 19(604)5213 and Studies of the Reaction between W and Al_2O_3, Contract AF 19(604)4083. 1 Aug 60, 51p. 10 refs. TR 60-704-104-204-205-208. 2; AFCRL-TN-60-993; AD-247 123.
Order from LC mi$3.60, ph$9.30 PB 153 431

Work continued on the development of experimental tubes adapted to study the thermionic properties of oxide cathodes applied on an ultrapure nickel base with a minimum of uncontrolled chemical contributions. An important phase of this work is the preparation of ultrapure nickel for cathodes. In connection with the study of the chemical reaction between tungsten and alumina the installation in the new spectrometer source of the components previously fabricated and assembled was started. A thermionic emission microscope adapted for research on emission phenomena is described. A review is presented of existing instrumentation. (Author)

Hazeltine Electronics Corp., Little Neck, N. Y.
DEVELOPMENT OF BEACON, RADIO AN/DPN-31(XE-1), by Robert Olsen, Ronald A. Orlando, and R. F. Teseo. Final technical rept. for 30 June 53-15 Nov 57 on Contract DA 36-039-sc-36590. [1957] 103p. 7 refs. Rept. 9905; AD-200 945.
Order from LC mi$5.70, ph$16.80 PB 154 418

Institute of Mathematical Sciences, New York U., N. Y.
DYNAMICS OF NONLINEAR STOCHASTIC SYSTEMS, by Robert H. Kraichnan. Rept. on Contract AF 49(638)341. July 60, 88p. 39 refs. Research rept. no. HT-7; AFOSR-TN-60-717; AD-245 489.
Order from LC mi$4.80, ph$13.80 PB 152 726

A method for treating nonlinear stochastic systems is described which it is hoped will be useful in both the quantum-mechanical many-body problem and the theory of turbulence. In this method the true problem is replaced by models that lead to closed equations for correlation functions and averaged Green's functions. The model solutions are exact descriptions of possible dynamical systems, and as a result they display certain consistency properties. The models involve a new stochastic element: Random couplings are introduced among an infinite collection of similar systems, the true problem corresponding to the limit where these couplings vanish. The method is first applied to a linear oscillator with random frequency parameter. Applications then are made to the Schrödinger equation of a particle in a random potential and to Burgers' analog for turbulence dynamics. For both problems, closed model equations are obtained which determine the average Green's function, the amplitude of the mean field, and the covariance of the fluctuating field.

John Carroll U., Cleveland, Ohio.
THEORY OF ULTRASONIC ATTENUATION IN CYLINDRICAL AND RECTANGULAR WAVEGUIDES, by E. F. Carome and J. M. Witting. Technical rept. no. 3 on Contract Nonr-2577(01). 31 Mar 60, 71p. 8 refs. AD-235 081.
Order from LC mi$4.50, ph$12.30 PB 153 775

A theoretical study is made of attenuation of ultrasound in cylindrical and rectangular waveguides. The systems treated consist of a piston source radiating into a bounded, non-absorbing medium and a receiver of the same size as the source. Expressions for receiver output are derived, and acoustic loss as a function of path length is computed for various source and waveguide configurations. Boundary conditions corresponding to both perfectly rigid and perfectly free walls are considered. Oscillations in receiver output as a function of path length are predicted, and these oscillations are especially large for the rigid wall cases. The waveguide approach is extended to the limiting case of radiation into an unbounded medium, and results are given for both square and cirular systems. In the latter case the curve of loss versus path length agrees well with that previously obtained using more conventional diffraction theory. (Author)

Johns Hopkins U. School of Engineering, Baltimore, Md.
REPRESENTATION AND ANALYSIS OF SIGNALS. PART II. AN ORTHONORMAL FILTER FOR EXPONENTIAL WAVEFORMS, by David C. Lai. Rept. on Contract AF 19(604)1941. 15 June 58, 52p. AFCRC TN-58-191; AD-152 443.
Order from LC mi$3.60, ph$9.30 PB 154 483

This report released for sale to the public 13 Mar 61.

A brief description is given of the mathematical notions such as orthogonal vector spaces, and the spectral theory of functions and operators, which have been widely used in physics, especially in Quantum mechanics. Although all of these techniques have been discussed, to some extent in the engineering literature in connection with signal theory and information theory, they have not yet been reduced to a practical form which can be manipulated easily. This report describes a newly designed device which will generate sets of orthonormalized exponential functions; measure the coordinates of a signal vector in the space spanned by these exponential functions; synthesize the signal from its vector representation by forming linear combinations of the basis; transform the basis into a new basis as desired; represent an arbitrary system by its H matrix; and simulate the system for a given class of signals. Experimental results are given to demonstrate some of these important applications. A very detailed circuit description and step-by-step instructions on the use of the equipment are given. (Author) (See also PB 133 065-R)

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
HIGH-DIELECTRIC-CONSTANT MATERIALS AS CAPACITOR DIELECTRICS, A STUDY IN DIELECTRIC SPECTROSCOPY, by A. von Hippel and W. B. Westphal. Final rept. on Contract AT(30-1)1937, continued under Contract Nonr-1841(10). Dec 59, 76p. 36 refs. Technical rept. 145; AD-232 381.
Order from LC mi$4.50, ph$12.30 PB 152 128

A comparison was made of the electrical properties for materials of normal dielectric constant (Al_2O_3 and $MgTiO_3$) with those of high dielectric constant (TiO_2, $CaTiO_3$, $SrTiO_3$, $[Ba_{0.65}Sr_{0.35}]TiO_3$, and $BaTiO_3$). Single crystals and ceramics were investigated from dc to the microwave range as a function of time, temperature, field strength, and prehistory. Three types of relaxation spectra were identified; one was caused by dipolar groups in unequal double wells,

and the other 2 were caused by charge carriers stopped in the volume of the material or in front of the electrodes, respectively. O-H groups in rutile, identified by IR absorption, appeared to cause a dipolar spectrum by thermal excitation leading to H-bond formation. The nonlinear response characteristics of $BaTiO_3$ and $(Ba_{0.65}Sr_{0.35})TiO_3$ were measured in the ferro- and paraelectric range and the onset of ferroelectricity for $SrTiO_3$ at liquid-He temperature. Some dc breakdown data are given for ceramics, and impulse and dc strength measurements on rutile single crystals parallel and perpendicular to the axis.

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE DESIGN OF AN "ERROR-FREE" DATA TRANSMISSION SYSTEM FOR TELEPHONE CIRCUITS, by B. Reiffen, W. G. Schmidt, and H. L. Yudkin. Rept. on Contract AF 19(604)7400. 22 Dec 60, 30p. 12 refs. 25G-0029; AD-248 637.
Order from LC mi$2.70, ph$4.80 PB 153 803

Recent experimental results verify that easily implemented codes can detect essentially all errors occurring in digital data sent over toll grade telephone circuits. A two-way communications system is described which uses these codes to detect the occurrence of errors and requests a retransmission of any data in error. The feedback logic is described in detail and the buffer required to adapt the system to various data sources is discussed. Extrapolated experimental results indicate that the system will deliver data in each direction at an average rate of approximately 7/8 the modem bit rate with a mean time to error of several hundreds of years. The philosophy that guided the design of this system can be applied to other media where high noise bursts or low signal levels occur infrequently. (Author)

Lincoln Lab., Mass. Inst. of Tech., Lexington
EFFICIENT ITERATIVE METHODS FOR OPTIMIZING THE PERFORMANCE OF MULTI-PARAMETER NOISY SYSTEMS, by Harold Kushner. Rept. on Contract AF 19(604)7400. 20 Oct 60, 75p. 5 refs. 22 G-0043; AD-245 802.
Order from LC mi$4.50, ph$12.30 PB 152 970

The modified Keifer-Wolfowitz process is extended to multi-parameter problems. The basic process is an iterative method of locating the maximum or minimum of regression functions under very general conditions. The modifications form a process that adjusts itself to the curve being operated on such that the rate of convergence is a maximum.

Little, Arthur D., Inc., Cambridge, Mass.
METHODS FOR PRECISION TEMPERATURE CONTROL, by Theodore P. Heuchling, Igor A. Black, and Anne Everest. Quarterly progress rept. no. 1, 15 May-15 Aug 60 on Contract DA 36-039-sc-85328. [1960] 68p. AD-244 236.
Order from LC mi$3.90, ph$10.80 PB 153 246

The purpose of this project is to study methods and devices by which the temperature of a single quartz crystal blank can be maintained at 85°C in ambient temperatures ranging from ±80°C to -55°C. Two ovens - one having an average energy input of 500 milliwatts; the other an average energy input of 50 milliwatts - are to be investigated. The volume of each oven must not exceed 3 cubic inches and the 500 milliwatts oven must be designed so that the crystal within it is accessible. The design problems presented by the 500 milliwatt and 50 milliwatt ovens were analyzed. The steady state heat flux through the insulation and electrical leads was calculated and the type of insulation for the prototype ovens was selected. An experimental model of the 500 milliwatt oven was made and tested in the cold chamber. The materials necessary to manufacture 50 milliwatt oven were ordered. The problem of the thermostatic control within the oven prompted the design of a thermostat. (Author)

Lowell Technological Inst. Research Foundation, Mass.
A PHASE HEIGHT AND AMPLITUDE RECEIVING AND RECORDING SYSTEM FOR MEASURING IONOSPHERIC WINDS, by Kenneth F. Kinnard and Vernon D. Turner. Final rept. for Jan 59-June 60 on Specialized Data Receiving and Recording System, Contract AF 19(604)5461. June 60, 50p. AFCRL TR-60-410.
Order from LC mi$3.30, ph$7.80 PB153 821

This report contains a description of equipment designed and built for measuring changes in phase and amplitude of pulsed radio waves reflected from the ionosphere. Phase measurements are made by integrating a d. c. signal over the time period between zero crossings of the transmitted and received signals. Amplitude measurements are made by peak detection of gated echo pulses. Recording is in analog form on dual-channel magnetic tape. (Author)

Marine Physical Lab., Scripps Institution of Oceanography, San Diego, Calif.
THE DETECTION OF WEAK SIGNALS BY CORRELATION METHODS, by Philip Rudnick. Rept. on Marine Physics Research, Contract NObsr-43356. 10 May 52, 30p. 7 refs. SIO Reference 52-26.
Order from LC mi$2.70, ph$4.80 PB 154 546

This report released for sale to the public 2 Mar 61.

Marine Physical Lab., Scripps Institution of Oceanography, San Diego, Calif.
THE MEASUREMENT AND DETECTION OF STEADY A.C. AND D.C. SIGNALS IN NOISE, by Carl Eckart. Rept. on Marine Physics Research, Contract NObsr-43356. 4 Oct 51. 71p. 8 refs. Reference 51-39.
Order from LC mi$4.50, ph$12.30 PB 154 545

This report released for sale to the public 2 Mar 61.

[Melabs[Inc., Palo Alto, Calif.
STUDY OF A PARAMAGNETIC SEARCH RECEIVER, by Jack L. Melchor and James H. Burgess. Final rept. for 1 Oct 57-30 Sep 58 on Contract DA 36-039-sc-74844. [1958] 55p. 10 refs. AD-207 750.
Order from LC mi$3.60, ph$9.30 PB 150 894

The feasibility of using organic free radical in a 500-1000 mc paramagnetic receiver has been demonstrated. Useful operation applies only to CW signals at present with frequency resolution of 1 mc. Serpentine lines above a ground plane were used in the resonance test section. The test section was mounted inside a solenoid with homogeneous field. Magnetic field of the solenoid could be swept from a value corresponding to resonance at 500 mc to that of 1000 mc in 0.1 second. Sensitivity of the system manually swept was -50 dbm when used with a narrow band 1000 cps amplifier-meter and -77 dbm with an added TWT preamplifier. Comparisions of measured sensitivities are made with theoretical sensitivities. Although the receiver is not competitive with the sensitivity of a video receiver in this frequency range, it provides additional frequency information which is not available from a video receiver. Several other uses of paramagnetic resonance are suggested for systems applications.

Microwave Lab., Stanford U., Calif.
NUMERICAL SOLUTIONS TO THE SPACE-CHARGE LIMITED FLOW OBTAINED BY THE SEPARATION OF VARIABLES METHOD, by P. T. Kirstein, R. Kantor and J. Szego. Scientific rept. no. 23 on Contract AF 19(604)1930. Aug 60, 80p. 11 refs. M.L. rept. no. 714; AFCRL-TN-60-999.
Order from LC mi$4.50, ph$12.30 PB 153 503

The method of separation of variables was used many years ago by Langmuir to find a limited number of solutions to the equations of space-charge limited flow. In this paper a whole new class of solutions to this problem by the method of separation of variables is discussed. These new solutions are characterized by the curvilinear nature of the electron trajectories, in contrast to Langmuir's, which were rectilinear. The mathematical method used here permits the reduction of the partial differential equations describing the flow to a set of ordinary differential equations which are subsequently solved on a digital computer. A large number of different solutions were obtained in this manner and have been tabulated in this paper. Because of their unique and varied nature, they should find numerous applications in the field of electron beam generation. (Author)

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
INVESTIGATION OF MICROWAVE FREQUENCY HARMONIC GENERATION IN PLASMAS, by R. F. Whitmer. Final rept. for 1 Mar 57-31 Aug 58 on Contract DA 36-039-sc-73187. 21 Aug 58, 47p. 5 refs. Technical rept. MPL-14; AD-204 225.
Order from LC mi$3.30, ph$7.80 PB 150 898

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
AN ALGEBRAIC METHOD FOR THE DETERMINATION OF THE OPEN-LOOP TRANSFER FUNCTION FROM THE CLOSED-LOOP SYSTEM FUNCTION, by Jerry M. Mendel. Thesis. Rept. on Contract DA 30-069-ORD-1560. 25 July 60, 49p. 3 refs. Research rept. PIBMRI 849-60; OOR rept. 1538.13-E; AD-242 701.
Order from LC mi$3.30, ph$7.80 PB 153 663

The results of an investigation to find a new method for the determination of the open-loop transfer function from the closed-loop system function are presented. The system is a single-loop feedback control system. A new method is developed which is algebraic and exact, the results of which are presented as general equations. The method is rapid and increases the circumspection of the designer in that not only is the open-loop transfer function determined but also the sensitivity of the closed-loop transfer function to differential variations of a parameter K, in the forward path, is able to be controlled within limits. These limits are the same limits that determine the successful calculation of the open-loop transfer function by this new method. (Author)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
CHOOSING FUNCTIONS FOR ORTHONORMAL EXPANSIONS, by Robert A. Reiss. Rept. on Contract DA 30-069-ORD-2646. 25 July 60, 36p. 4 refs. Research rept. PIBMRI-848-60; OOR rept. 2268.3-E; AD-242 667.
Order from LC mi$3.00, ph$6.30 PB 153 677

A method for treating the identification problem in adaptive control systems is to approximate the impulse response of the system by a series of orthogonal exponential functions. The problem is to develop a method for choosing the particular exponential functions which gives the best approximation with the fewest number of terms. A procedure is investigated for the case where the system has one negative real pole varying between two extremes known to the designer and where an expansion of not over three terms is desired. The method of optimizing the coefficients of a series expansion in the integral square error sense is reviewed, and the technique of orthogonalizing exponential functions is shown. A one and two term series expansion are investigated, and the optimum placement of the poles of the approximating function are found for minimizing the maximum normalized error between the actual and approximate impulse response. Although an exact solution is not found in the three term series expansion, an iterative procedure is suggested for calculating the optimum exponential approximating functions. (Author)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
MILLIMETER WAVEGUIDE COMPONENTS, by J. W. E. Griemsmann. Comprehensive final rept. on Contract DA 36-039-sc-73219. 1 May 58, 84p. 26 refs. Rept. R-656-58; PIB-584; AD-201 672.
Order from LC mi$4.80, ph$13.80 PB 150 897

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Basic research program
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Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.

REALIZATION OF BOOLEAN POLYNOMIALS BASED ON INCIDENCE MATRICES, by S. Okada, Y. Moriwaki, and K. P. Young. Rept. on Contract AF 18(600)1505. 16 Nov 59, 37p. 41 refs. Rept. no. R-790-59; PIB-718; AFOSR TN-59-1299; AD 230 765.
Order from LC mi$3.00, ph$6.30 PB 153 234

An algebraic method for finding minimum switching 2-terminal networks for any given Boolean polynomial S is established by adopting node-branch incidence matrices as unknown quantities. Generators of invariant transformation group of S are determined. Prime implicant S_1, or any other equivalent polynomial S_i, are expressed by loops passing the relay branch and by a set of vectors $C_g(i)$ modulo 2 in a branch-number-dimensional affine space. Dually open circuit conditions R_j are expressed by a set of hyperplane covectors $B^f(i)$ of cut-sets. $B^f(i)$ and $C_g(i)$ give realizable range of number of nodes, branches, and degree of freedom for each R_i and S_i. Base vectors $C_p(i)$ of subspace $C_g(i)$ and all vectors $C_k(i)$ which express loops passing the relay branch are determined based on linear dependency. Dually $B^f(i)$ gives base covectors $B^a(i)$ and all covectors $B^h(i)$ of cut-sets cutting the relay branch. Sneak paths or barriers in $B^h(i)$ or $C_k(i)$ are eliminated by increase of contacts. Networks of solution are obtained from either $B^a(i)$ or $C_q(i)$ by a new graphical or algebraic ambit-method, generally with addition of some pseudo-ties $C_n(i)$ which are loops including make and break contact of a relay in series. Dually, pseudo-cuts $B^m(i)$ can be added to $B^a(i)$ for realization. (Author)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.

A STUDY OF MULTI-PATH TRANSMISSION LINE FILTERS, by Kei Takiyama. Rept. on Contracts DA 36-039-sc-78001 and AF 30(602)1650. 5 Mar 59, 75p. 1 ref. Research rept. R-693-58; PIB-621; AD-220 851.
Order from LC mi$4.50, ph$12.30 PB 153 598

Research is concerned with the analysis of multi-path transmission line sections and their use as filter elements. Design techniques are developed for a filter containing two-path line sections. The impedance and transfer matrices for the multi-path sections and the image parameters for these sections are derived. The corresponding parameters are obtained for the network consisting of a multi-path section connected between 2 lengths of ordinary transmission line. The conditions under which infinite insertion loss is realized are of particular interest in filter designs. These conditions and their physical meaning are examined. When many filter sections are connected in cascade, the image parameters are most useful for determining the characteristics of complete filters. The results of the discussion concerning the characteristics of the image parameters are tabulated and design equations are derived for the two-path low pass filter using these tables. (Author)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.

NEW CONCEPTS FOR RADIO FREQUENCY TRANSMISSION LINES, by Pietro P. Lombardini, Richard C. Schwartz, and Leon W. Zelby. Rept. for Sep 59-July 60 on Contract AF 33(616)6769. 31 Aug 60, 69p. 36 refs. WADD Technical rept. 60-701.
Order from OTS $1.75 PB 171 557

The work contained in this report has been aimed towards development of new concepts of point-to-point transmission of radio frequency energy, suitable for general applications in air and space craft. The lines investigated were: (a) a modified Goubau line (b) an electrolytic transmission line, and (c) a magneto-ionic line. Basically, line (a) implies the use of many directionally coupled G-lines as a way of improving the performance of a single G-line from the viewpoint of radiation losses. Experimental results obtained were inconclusive and further work is required, but the study of electromagnetic wave propagation on coated wires has been extended. Line (b) was found too lossy for practical use. The study of line (c) was limited to a cylindrical waveguide filled with plasma and subjected to an axial magnetic field. This line offers the possibility of simultaneous transmission in low and high frequency bands. (Author)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.

A STRATEGIC PATTERN RECOGNITION PROGRAM FOR THE GAME GO, by David Lefkovitz. Technical note no. 4 on General Switching Theory, Contract AF 33(616)5886. 1 July 60, 97p. 1 ref. WADD Technical note 60-243.
Order from OTS $2.25 PB 171 549

A set of "primitive" routines are defined for characterization of patterns on the GO board. Strategic patterns are listed in a "Catalogue by primitive classes" and organized into a tree structure. (Author)

Motorola, Inc., Scottsdale, Ariz.

ELECTRONIC SURVEYING EQUIPMENT, RADAR SET AN/PPN-13 (XE-2), by D. Zusman. Final rept. for 1 June 57-30 June 59 on Contract DA 36-039-sc-74833. 15 Dec 59, 115p. 5 refs; AD-244 779.
Order from LC mi$6.00, ph$18.30 PB 153 595

Radar Set AN/PPN-13(XE-2) is an electronic surveying equipment designed to determine terrestrial distances by measuring the time required for electromagnetic energy to traverse the distance between two points. Two radar sets are used as beacons, one at each end of the unknown range, to alternately transmit and receive coded pulse pairs of 440-mc energy and thus establish a repetition period proportional to the station separation. A long internal time delay has been added to each equipment to place an upper limit on the mutual beaconing, or meaconing, frequency. This delay is extracted from the total period by using a second mode of operation called double traverse. This mode requires the signal to traverse each receiver twice before it is retransmitted to the other radar set; it also requires that delays encountered in both instances be equal. The latter is accomplished by automatic attenuation control of the signal during its second traverse. A counter unit measures the period in both

modes of operation and presents a direct digital output in units of propagation time, or in distance. The difference between these readings is the one-way air-path propagation time, or the distance in meters uncorrected by the index of refraction. Range capability is 1 to 50 miles, with accuracy of ± 1 part per 5000 for distances above 10 miles and ± 10 feet for distances less than 10 miles. (Author)

Naval Ordnance Lab., Corona, Calif.
SOLUTION OF THE GENERAL INTERFEROMETER ANTENNA-DIFFERENTIAL DETECTOR PROBLEM, by David F. Scheets. 15 Aug 60, 12p. NAVWEPS rept. 7152; NOLC rept. 528; AD-246 906.
Order from LC mi$2.40, ph$3.30 PB 153 294

The interferometer antenna-differential detector is an electromagnetic-radiation detection device that is used in certain directional sensing functions for missile guidance systems and missile fuzing systems. This report presents a derivation of a general solution for the output voltage of a device of this type. (Author)

Naval Ordnance Lab., White Oak, Md.
FERROMAGNETIC SWITCHING, by O. J. Van Sant. 18 Mar 58, 30p. 5 refs. NAVORD rept. 6076; AD-159 800.
Order from LC mi$2.70, ph$4.80 PB 154 771.

This report released for sale to the public 15 Mar 61.

The ferromagnetic switching process is analyzed to determine the minimum switching time and the mechanisms involved in the 180° switching processes. A special ferromagnetic equation of motion is presented which is used to analyze both the fast ferromagnetic switching process (irreversible domain rotation) and the slow ferromagnetic switching process (180° Bloch domain wall movement). The reversible magnetic viscosity coefficient is derived and from measurements made on the magnetic viscosity coefficient of 1/8 mil 4-79 Molybdenum Permalloy tape, the switching constants for slow and fast ferromagnetic switching are calculated; these calculations agree with experiment. It is shown how the effective width of the dynamic domain wall increases with an increase in the switching magnetic field intensity. This factor and others are applied to analyze the switching curve (magnetic intensity vs. the reciprocal of the switching time) and the shapes of the voltage traces observed during the switching process. (Author)

Naval Research Lab., Washington, D. C.
THE NRL MODEL E-5753 LEAK DETECTOR, by C. C. Minter, S. F. Andersen, and R. W. Dolk. Interim rept. 18 Jan 61, 9p. NRL rept. 5593.
Order from OTS $0.50 PB 171 358

A 21-pound portable Freon leak detector has been developed. Air from the vicinity of a probe is pumped through tubing so as to first pass two of the four cells of a thermal conductivity bridge and then through a length of tubing around to the other pair of cells. Thus if the probe is moved past a leak, the bit of Freon-containing air unbalances the bridge first in one direction and then in the other. These unbalances cause the successive flashing of a red light and a white light in the Lucite probe head, where the operator's attention is focused. Since the air flows past one end of each conductivity cell and not through it, a lag time occurs before the sample diffuses into the cell and reaches the filament; this lag time is predominant in producing a total lag time of at least 3 to 4 seconds. Bridge excitation is by a regulated ac power supply, and the ac output signal when the bridge is out of balance goes to a five-stage RC-coupled transistorized amplifier. Printed circuit and plug-in construction facilitates circuit checking and amplifier replacement. While the indicator gives a clear response for a Freon concentration of 4 to 5 ppm, such sensitivity is not needed under service conditions, where detection of the signal produced by changing the concentration of Freon by 50 ppm is satisfactory in most cases. (Author)

Pontificia Universidade Catolica, Rio de Janeiro (Brazil).
SINGULARITIES OF LINEAR SYSTEM FUNCTIONS, by Bernhard Gross and Elde Pires Braga. Rept. on Contract AF 49(638)648. Sep 60, 127p. 39 refs. AFOSR TN-60-104; AD-246 691.
Order from LC mi$6.30, ph$19.80 PB 153 107

A discussion of the general, finite or infinite, homogeneous ladder structure with lumped or continuously distributed parameters is given. The use of infinite continued fraction expansions for the representation of highly singular network functions is discussed. Examples of networks with various singularities are given. Complex singularities were found to occur always in conjugate pairs. Branch cuts are shown to be physically interpreted as line singularities resulting from distributions of alternating poles and zeros which have become infinitely dense. A method for the determination of the locus and number of poles without knowledge of the coordinates of the individual poles is given. Some problems of equivalence of networks are discussed. Examples are given for equivalence between an infinite continuous and an infinite lumped network and for equivalence between a finite continuous and an infinite lumped network. (Author)

Radio Corp. of America, Harrison, N. J.
A STUDY OF ELECTRON TUBE DETERIORATION UTILIZING KINETIC THEORY, by E. R. Schrader. Quarterly rept. no. 1, 1 July-1 Oct 59 on Contract NObsr-77637. [1959] 34p. 5 refs; AD-227 147.
Order from LC mi$3.00, ph$6.30 PB 154 544

This report released for sale to the public 2 Mar 61.

Research concerns the establishment of basic kinetic characteristics on 2 tube types and detailed supporting work on gas evolution, sublimation and tube processing and aging. Initial experiments give the gas evolution vs. time for some typical receiving tube plate materials at one representative condition of temperature. Kinetic data was secured for 3 plate materials showing general expected trends and clarifying the need for more refined testing methods. A special test for measuring the gas, grid emission, leakage and retarding potential grid characteristics of tubes is described. An outline of the principles employed in setting up a computer solution for the Child-Langmuir equation is given. (Author)

Radio Corp. of America, Princeton, N. J.
HIGH-TEMPERATURE, IMPROVED EFFICIENCY, PHOTOVOLTAIC SOLAR ENERGY CONVERTER, by J. J. Wysocki, J. J. Loferski and others. Triannual progress rept. no. 6 for 16 Mar-15 July 60 on Contract DA 36-039-sc-78184. 31 July 60, 33p. 5 refs.
Order from LC mi$3.00, ph$6.30 PB 153 602

GaAs cells made by Zn diffusion using an open furnace are equivalent to those made in sealed ampules, except for a reduced surface concentration. Spectral response curves on GaAs cells indicate a lifetime in the diffused skin of approximately 10^{-10} sec. A spectral study of shallow Si junctions with n- and p-type surface layers yield a carrier lifetime in the base which is in good agreement with the lifetime measured by the pulse injection technique. The agreement is poor for deeper junctions. A light source calibrated by a standard solar cell gives accurate measurements of the sunlight conversion efficiency for only those cells which have a spectral response similar to that of the standard cell. Photovoltaic effects have been seen in metal-CdSe junctions. The threshold for radiation damage produced by electrons in phosphorus diffused Si appears to be significantly higher than the threshold in boron diffused Si. (Author)

Ray-O-Vac Co., Madison, Wis.
LOW TEMPERATURE BA-2270/U-XLT-1 BATTERIES, by J. W. Paulson. Interim rept. no. 1, 15 July 58-15 Aug 60, on Contract DA 36-039-sc-78144. [1960] 21p. 1 ref; AD-244 298.
Order from LC mi$2.70, ph$4.80 PB 153 935

The purpose of this work was to construct 500 BA-2270/U batteries of the flat cell type for initial and delayed service testing. This production was preceded by the construction of 50 preproduction batteries for 0 and 3 month testing. A performance of 6 to 8 hr at -40°F is obtainable at 3 mo in the flat cell type construction providing the battery can be maintained free of construction defects causing leakage. Failure of A sections was caused by the occasional occurrence of microscopic pinholes in the conductive sheeting which caused partial loss of a section by corroding off the aluminum foil backing to the conductive sheeting, and general leakage due to heat seal failures, causing corrosion of terminal connections. Failures in B sections was due largely to intercell leakage plus the effects of general leakage due to heat seal failures which caused corroding off of terminal connections and/or corrosion of intercell connections. Batteries tested at 0 months did not exhibit the high percentage of failures that occurred at 3 mo. The factors causing failure, though present initially, developed to a damaging degree during the 3-mo storage period. Batteries giving the design performance of 6 to 8 hr generally were free of construction defects. No advantage was apparent in storing at 35°F as compared to storing at 70°F after 3 mo. Performances at 70°F were about 60 hr in a battery free of the aforementioned defects. Where defects occur performances drop to about 30 hr. C sections are performing satisfactorily. (Author)

Raytheon Co., Burlington, Mass.
STUDY OF PLATINOTRON DEVICES. Quarterly rept. no. 5, 1 Nov 59-1 Ja 60, on QKS779, Contract DA 36-039-sc-78229. [1960] 22p. AD-240 192.
Order from LC mi$2.70, ph$4.80 PB 153 230

Progress on the QKS779 platinotron tube is discussed. The dissipation density evaluation for the anticipated slow-wave structure indicates an anode dissipation rating of 1 kw. The necessary cooling system has been designed, constructed from commercially available components, tested and found to be adequate. Tests have been run on the cathode that insure the capability of the cathode to absorb any back bombardment that might be encountered in operation of the tube. A small amount of hot test information has been obtained that indicates that the leakage currents are satisfactorily low. Five tubes have been constructed. Information from the construction of these tubes has determined the direction of the mechanical design refinement program. Cold testing has produced information about the net-work insertion loss and phase shift. Hot tests have been run which indicate that voltage breakdown should not be a problem. (Author)
(See also PB 150 446)

RCA Service Co., Camden, N. J.
A PREDICTION OF AN/GRC-27 RELIABILITY, by H. L. Wuerffel, D. I. Troxel and others. Rept. on Contract AF 30(602)1623. 26 Aug 57, 81p. 5 refs. RADC-TN-58-18; AD-148 554.
Order from LC mi$4.80, ph$13.80 PB 154 516

This report released for sale to the public 2 Mar 61.

The AN/GRC-27 Radio Set is a ground base communications equipment that operates between 225.0 and 399.9 mc. The reliability analysis, conducted on an individual part basis, indicates a Mean Life of 399 hours for the complete equipment being used under the typical 4:1 receive-transmit operating ratio. This results in a Probability of Survival of 94.2 percent for a 24 hour period. Corresponding mean life values for the individual components are: Receiver, 884 hours; Transmitter 1097 hours; Modulator 2161 hours. The electrical stress levels indicate the design to be moderately conservative. The overall temperature rise is about 8 to 10 degrees Centigrade but the packaging is such that localized hot spots may exist. (Author)

RCA Service Co., Camden, N. J.
A PREDICTION OF ELECTRONIC RELIABILITY FOR THE AN/FPS-3 SEARCH RADAR EQUIPMENT, by H. L. Wuerffel, G. J. Galanek and others. Rept. on Contract AF 30(602)1623. 1 Oct 57, 94p. 5 refs. RADC-TN-58-19; AD-148 555.
Order from LC mi$5.40, ph$15.30 PB 154 844

This report released for sale to the public 16 Mar 61.

There are three general methods for prediction of reliability for complex systems. The methods are: part count, complete reliability analysis, and sampling. A random sampling technique was applied in the analysis of the AN/FPS-3. This technique is an attempt to advance the art of reliability prediction by reducing time and cost factors. Through the use of this random sampling approach the AN/FPS-3 is predicted to have the mean life (i.e. mean time between Random Failures) and probability of survival values shown below, assuming an equipment ambient temperature of 20°C.

Equipment	Mean Life (Hours)	Probability of Survival (%) for 24 hours
Overall		
AN/FPS-3	74	72
Tower Groups	221	90
Building Groups	111	81

(Author)

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
QUARTERLY PROGRESS REPORT NO. 52, by J. B. Wiesner, G. G. Harvey, and H. J. Zimmermann. Rept. for [30 Aug]-30 Nov 58 on Contract DA 36-039-sc-64637. 15 Jan 59, 203p. 88 refs.
Order from LC mi$9.30, ph$31.80 PB 154 190

This report released for sale to the public 16 Mar 61.

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(See also PB 143 556)

Sperry Microwave Electronics Co., Clearwater, Fla.
S- AND L-BAND FERRITE ATTENUATORS FIXED CN-()/GP, by B. Duncan, W. Heithaus and others. Interim development rept. no. 4, 15 Apr-14 July 58, on Contract AF 30(602)1724. 15 Aug 58, 25p. 6 refs. Sperry rept. no. 200-13019-4; RADC-TN-58-269; AD-148 930.
Order from LC mi$2.70, ph$4.80 PB 154 805

This report released for sale to the public 16 Mar 61.

S-band suppressor: Improved attenuation characteristics were obtained by better control of magnetic bias; transitions were designed, and the fabrication of parts was initiated for the final model. L-band suppressor: Broadbanding methods and heat dissipation problems were investigated.

Stanford Electronics Labs., Stanford U., Calif.
ACTIVE NETWORKS: PAST, PRESENT AND FUTURE, by J. G. Linvill. Rept. on Contract Nonr-225(24). 10 May 60, 11p. Technical rept. no. 1507-1; AD-238 165.
Order from LC mi$2.40, ph$3.30 PB 148 411

The decade of the forties saw the full-scale development of the feedback system and the assessment of the limitations inherent in the parasitic elements that always accompany active components. The problem of realization of low-drift structures in the presence of drifting elements was attacked. The first encounter of the network theorist with elements that refuse to behave like a simple model brought new ideas and approaches. The fifties was the decade of the transistor. The transistor, less capable of simple representation than its predecessors, offered new capabilities to reward the network designer. The physicist and network theorist, each being now more dependent on the other, have been drawn together. Many of the old problems have been re-solved without the earlier simplifying assumptions. The pressure to make more complex, more compact and faster systems bids to make the sixties the decade of integration of the device with the circuit. The key problems inherent in this area are just now emerging. Their solution will depend on certain foundation lines drawn earlier, but with detailed character that is new. The purpose of this paper is to trace the development of areas of emphasis in the field of active networks, to note the evolution of its character with the changes occurring in its scope and then finally to look briefly at the opportunity it presents in the future. (Author)

Stanford Research Inst., Menlo Park, Calif.
INVESTIGATION OF METHODS OF SCANNING THE BEAMS OF LARGE ANTENNAS, by W. F. Gabriel and M. G. Andreasen. Scientific rept. 12, 1 Mar-31 May 60, on Contract AF 19(604)2240. Sep 60, 80p. 25 refs. SRI Proj. 2184; AFCRL-TN-60-1106; AD-246 455.
Order from LC mi$4.50, ph$12.30 PB 153 203

An investigation is presented of both electrical and mechanical methods for scanning the beams of large, ground-based antennas. The compound interferometer is discussed as a possible radar antenna. The compound interferometer is a radio astronomy antenna which has a single-lobed power radiation pattern of the form sin α/α, with approximately half the beamwidth of a conventional antenna of the same aperture dimension. In addition, this antenna offers the unique advantage of almost unlimited aperture conservation (reduction in the number of elements) with savings of 75 to 95 percent readily attainable. When operated in "pseudomonopulse" fashion, rather than being phase-switched, it can have a gain commensurate with the amount of active aperture (number of elements) employed. High sidelobes are a major problem with this antenna, although, for radar point target situations, they can be reduced to the extent of near-elimination by means of simple video circuit techniques. As an aid to better understanding of antennas of this type, a brief review section is included on the application of Fourier Transform Techniques to antenna analysis. Linear antenna arrays with differently spaced elements are discussed. A linear array with variable

spacing may approximate a desired space factor better than a similar array with constant spacing. Some methods of synthesizing linear arrays with variable spacing are considered. Most methods for finding the array parameters involve the solution of fairly complicated systems of equations. (Author) (See also PB 149 543)

Stanford Research Inst., Menlo Park, Calif.
THEORETICAL LIMITATIONS ON THE BROADBANDING POTENTIAL OF ANTENNAS, WITH APPLICATION TO CAVITY BACKED SLOTS AND OTHER ANTENNAS, by A. Vassiliadis and R. L. Tanner. Technical rept. no. 71 on Contract AF 19(604)3458. Aug 60, 110p. 12 refs. SRI Proj. 2494; AFCRL TN-60-997; AD-246 316.
Order from LC mi$5.70, ph$16.80 PB 153 097

A method is presented whereby, for a given antenna, the maximum bandwidth possible for a certain VSWR is estimated. The optimum bandwidth is obtained by applying the lumped element circuit theory, so that a rational function approximation to the antenna input impedance must first be obtained. The functions used are sufficiently complex so that a good approximation to the antenna impedance is obtained up to a frequency where the wavelength approaches the size of the antenna. The method is applied to a number of slot antennas. The effects on optimum bandwidth of such factors as end-loading, depth of the backing cavity, width of the slot, and electrical size, are discussed. An an example of a commonly used practical antenna the E-fed VOR cavity antenna is treated. Finally, the method is applied to both simple and folded dipole antennas, and it is shown that the folded dipole has a poorer broadbanding potential than the equivalent simple dipole. The superiority of the simple antenna is very slight for antennas with half length greater than $\lambda/8$, but becomes pronounced for antennas appreciably shorter than this. (Author)

Technische Hochschule, Vienna (Austria).
HYDRODYNAMICAL TREATMENT OF PLANE ELECTRON FLOW, by H. Potzl, O. Hintringer, and K. Richter. Annual technical rept. no. 1, 1 Nov 58-31 Oct 59, Contract DA 91-591-EUC-986. 30 Nov 59, 64p. 56 refs. AD-231 358.
Order from LC mi$3.90, ph$10.80 PB 153 276

A simplified approach to the problem of one-dimensional electron flow is given. The present method is based on the transport equations of macroscopic particle density and momentum (hydrodynamical equations) which are derived from the Liouville equation. Results of different approximation methods are compared with density function results for the stationary case and it is seen that the assumption of constant kinetic temperature is promising. The equations of the isothermal diode problem are solved for the stationary and nonstationary case neglecting the ac behavior of kinetic temperature. For the stationary case a solution can be given in closed form which is continuous in the potential minimum plane. Different types of isothermal diode flow are discussed. An analytical expression was derived for the ac solution. In the experimental part, noise measurements on plane diodes at 2 mc are described. The results show a less rapid decrease of the suppression factor with increasing plate voltage than all existing theories predict. The suppression factor is between 0.5 and 2 mc independent of frequency and has a wavy form originating from elastically reflected electrons. Noise measurements on plane diodes in a longitudinal magnetic field show dependent on magnetic field strength, sharp noise peaks at certain plate voltages. (Author)

Telephonics Corp., Huntington, N. Y.
THE DESIGN AND FABRICATION OF FOUR AUDIO ACCESSORIES DESIGNED FOR USE WITH BROADBAND FM RADIO EQUIPMENT, AND ONE DESIGNED FOR USE WITH FOUR WIRE AUTOMATIC FIELD TELEPHONE SETS, by Harold C. Rowehl and William S. Craig. Final engineering rept. for 27 Nov 57-30 Apr 60 on Contract DA 36-039-sc-74880. 30 Apr 60, 118p. 21 refs. Rept. no. 235-25; AD-242 747.
Order from LC mi$6.00, ph$18.30 PB 153 228

This report covers the design and fabrication of five audio accessories. The development of the AN/VRC-12 brought about a need for appropriate audio accessories for use with forward area combat radio communication equipment. This report discusses the difficulties encountered in meeting performance requirements without abrogating the weight, shape, or size requirements. Illustrations, tabular data and text are used to substantiate conclusions reached and equipment design. The human engineering and engineering feasibility portions of this project are reinforced by the "Human Factors Report", submitted as an Appendix to this report. Universal application of components is stressed throughout the report and; consistently, is emphasized in the design of these audio accessories. (Author)

Wisconsin U., Madison.
SURFACE WAVE, ANTENNA AND MICROWAVE FILTER ENGINEERING RESEARCH STUDY, by Elmer H. Scheibe. Quarterly progress rept. no. 2, 1 Dec 59-29 Feb 60, on Contract DA 36-039-sc-78326. 31 Mar 60, 18p. 10 refs. AD-243 872.
Order from LC mi$2.40, ph$3.30 PB 153 243

A reasonably complete study of a one stage constant input impedance microwave branching filter was made. A simple sweep frequency generator formed by applying a sawtooth voltage to the repeller of a klystron was used to tune and adjust the filter. The measured and predicted characteristics of the filter were in good agreement. Work on the two stage branching filter will now proceed. Work on the design and construction of an open resonator for making loss measurements on a waveguide beam line was started in this period. It is hoped the resonator will be completed and ready for test during next period. (Author) (See also PB 153 242)

Wisconsin U., Madison.
SURFACE WAVE, ANTENNA AND MICROWAVE FILTER ENGINEERING RESEARCH STUDY, by Elmer H. Scheibe. Quarterly progress rept. no. 3, 1 Mar-31 May 60, on Contract DA 36-039-sc-78326. 30 June 60, 28p. 10 refs. AD-242 437.
Order from LC mi$2.70, ph$4.80 PB 153 244

A brief discussion, with illustrations by means of photographs, of the various filter configurations used in the complete filter study is given in this report. The study of a two stage constant impedance microwave branching filter was completed. This study involved the design, fabrication, and final testing of the filter. The measured characteristics of the filter were in excellent agreement with those predicted from the equivalent circuit. Work on the construction of an open resonator to be used for making loss measurements on a waveguide beam line was continued. (Author) (See also PB 153 243)

Ordnance, Missiles, and Satellite Vehicles

[Aero-Space Labs.] North American Aviation Inc., Downey, Calif.
DESIGN, DEVELOPMENT, AND TESTING OF ADVANCED PNEUMATIC SOLENOID VALVE (SINGLE-PASSAGE) PART NO. 4683-59302, by Charles P. Bacha. Subcontract to Rocketdyne, Contract AF 04(647)160. Nov 59, 126p. 8 refs. Rept. MD 59-79; AFBMD TR-59-18; AFBMD Doc. no. 60-862; AD-232 180.
Order from LC mi$6.30, ph$19.80 PB 153 613

Design, development, operation, and analysis of a single-passage pneumatic solenoid valve are described. Results of performance demonstration, flight rating, and qualification tests are given and analyzed. Standard test equipment used is listed, and descriptions are given of procedures and arrangements for special tests such as combined environment and limit tests. Conclusions derived from test results are stated, along with recommendations for further development. (Author)

Aerojet-General Corp., Azusa, Calif.
HYPERVELOCITY-DATA RECORDING SYSTEMS (A COMPREHENSIVE BIBLIOGRAPHY), by J. L. Squier and G. J. Woffinden. Rept. on Contract AF 08(603)4558. Feb 59, 88p. 533 refs. Aerojet rept. no. 1541 (Supplement); APGC-TR-59-33 (II); AD-216 294.
Order from LC mi$4.80, ph$13.80 PB 154 968

This report released for sale to the public 16 Mar 61.

References are listed by subject in 4 categories; optical, radiation, electrical, and mechanical methods. Some of the references are listed several times, each under a different heading. This is not a complete bibliography in the field of high speed instrumentation. (Author)

Aeronautical Research Lab., Air Force Research Div., Wright-Patterson AFB, Ohio.
A SUPER-FAST RECORDER FOR DAY AND NIGHT OBSERVATIONS OF SPACE VEHICLES USING A LIGHT AMPLIFIER CAPABLE OF SUPPRESSING THE BACKGROUND AND DISCRIMINATING MOVING OBJECTS, by Radames K. H. Gebel. Rept. on Research on the Quantum Nature of Light. Nov 60, 21p. 18 refs. ARL Technical note 60-109.
Order from OTS $0.75 PB 171 108

The usefulness of the closed circuit television light amplifier system capable of suppressing the background and discriminating moving objects is emphasized for detecting, tracking, and photographing missiles, etc., in flight. Special pick-up tubes have been developed which produce video signals from moving objects only and the mechanism involved is explained for two different solutions. The importance of these solutions consists in that it is the pick-up tube itself rather than any auxiliary electronic computer, which delivers a signal representing the moving object only. The improvements which may be expected by using an image converter tube as light intensifier between an optical system and the photographic camera is briefly discussed. (Author)

Air Force Ballistic Missile Div., Air Research and Development Command, Inglewood, Calif.
RELIABILITY PROGRAM FOR BALLISTIC MISSILE AND SPACE SYSTEMS. 1 June 59, 23p. AFBM Exhibit 58-10; Supersedes WDT Exhibit 57-3 of 16 Aug 57 and 23 Dec 57.
Order from LC mi$2.70, ph$4.80 PB 154 811

This report released for sale to the public 17 Mar 61.

The purpose of this exhibit is to provide effective requirements and procedures for implementing a reliability program by the contractor to assure the attainment of reliability goals and/or requirements specified by the procuring agency.

Airesearch Mfg. Co., Phoenix, Ariz.
DESIGN, DEVELOPMENT, AND TESTING OF MULTIPLE-PASSAGE PNEUMATIC SOLENOID VALVE AIRESEARCH PART 319152. VOLUME I, by H. P. Horacek, J. T. Haley and others. Final rept. on Contract AF 04(647)163. July 60, 178p. 14 refs. Rept. AE-7474-R, volume 1; AFBMD TR-60-179; AFBMD Doc. no. 60-6122, vol. 1; AD-243 350.
Order from LC mi$8.10, ph$27.30 PB 153 616-1

The multiple-passage solenoid valve configuration developed consists of a four-way valve controlled by an integrally mounted, internally-vented, solenoid operated pilot valve. Both the main valve and the solenoid valve employ double poppet and seat arrangement. The solenoid coil developed is capable of operation over a temperature range of -320°F to + 250°F with no appreciable change in current. The valve is designed for operation with cryogenic fluids in ballistic missile pressurization systems, and is capable of operating with inlet pressures up to 5000 psig. (Author)

Airesearch Mfg. Co., Phoenix, Ariz.
DESIGN, DEVELOPMENT, AND TESTING OF MULTIPLE-PASSAGE PNEUMATIC SOLENOID VALVE AIRESEARCH PART 319152, VOLUME II, by H. P. Horacek, J. T. Haley and others. [Final rept.] on Contract AF 04(647)163. July 60, 195p. Rept. AE-7474-R; enclosed is rept. nos. SC-5175, rev. 2, AE-6378-MR, rev. 3, AE-7029-MR, rev. 2, AE-7030-MR, rev. 2, AE-7518-MR; AFBMD TR-60-179-2; AFBMD Doc no. 60-6122, vol. 2; AD-243 351.
Order from LC mi$8.70, ph$30.30 PB 153 616-2

Contents:
Drawings
Preliminary specification for a four-way pneumatic solenoid valve
Test schedules
Design of a combined environmental test apparatus.
(See also PB 153 616-1)

Army Ordnance Corps, Washington, D. C.
ORDNANCE ENGINEERING DESIGN HANDBOOK: SERVOMECHANISMS. SECTION 1: THEORY, CONSISTING OF CHAPTERS 1-10. Aug 59, 232p. 180 refs. ORDP 20-136.
Order from OTS $3.50 PB 171 480

Contents:
Chap. 1. Properties of feedback control systems
Chap. 2. Dynamic response
Chap. 3. Methods for determining dynamic response of linear systems
Chap. 4. Stability of feedback control systems
Chap. 5. Gain determination
Chap. 6. Compensation techniques
Chap. 7. Performance evaluation
Chap. 8. Optimization methods for transient and stochastic inputs
Chap. 9. Data systems
Chap. 10. Nonlinear systems

Army Ordnance Corps, Washington, D. C.
ORDNANCE ENGINEERING DESIGN HANDBOOK: SERVOMECHANISMS. SECTION 2: MEASUREMENT AND SIGNAL CONVERTERS, CONSISTING OF CHAPTERS 11 AND 12. Aug 59, 129p. 89 refs. ORDP 20-137.
Order from OTS $2.75 PB 171 481

Contents:
Chap. 11. Sensing elements
Chap. 12. Signal converters.
(See also PB 171 480)

Army Ordnance Corps, Washington, D. C.
ORDNANCE ENGINEERING DESIGN HANDBOOK: SERVOMECHANISMS. SECTION 3: AMPLIFICATION, CONSISTING OF CHAPTER 13. Aug 59, 224p. 62 refs. ORDP 20-138.
Order from OTS $3.50 PB 171 482

Contents:
Chap. 13. Amplifiers used in controllers.
(See also PB 171 481)

Army Ordnance Corps, Washington, D. C.
ORDNANCE ENGINEERING DESIGN HANDBOOK: SERVOMECHANISMS. SECTION 4: POWER ELEMENTS AND SYSTEM DESIGN. Aug 59, 206p. 97 refs. ORDP 20-139.
Order from OTS $3.00 PB 171 483

Contents:
Chap. 14. Power elements used in controllers
Chap. 15. Mechanical auxiliaries used in controllers
Chap. 16. Typical procedure
Chap. 17. Representative designs
Chap. 18. Auxiliaries associated with servomechanisms
Chap. 19. Constructional techniques
Chap. 20. Supplementary tables, formulas, and charts
(See also PB 171 482)

Army Ordnance Corps, Washington, D. C.
ORDNANCE MATERIALS HANDBOOK. CORROSION AND CORROSION PROTECTION OF METALS. July 57, 88p. 80 refs. Ordnance Corps Pamphlet ORDP 20-311.
Order from LC mi$4.80, ph$13.80 PB 154 757

This report released for sale to the public 15 Mar 61.

Army Ordnance Corps, Washington, D. C.
ORDNANCE MATERIALS HANDBOOK. TITANIUM AND TITANIUM ALLOYS. Oct 56, 27p. 4 refs. Ordnance Corps Pamphlet ORDP 20-305.
Order from LC mi$2.70, ph$4.80 PB 154 756

This report released for sale to the public 15 Mar 61.

Directorate of Research Analysis, Holloman AFB, N. Mex.
ON THE USE OF A RADIOACTIVE SOURCE IN THE VELOCITY MEASURING SENSING HEAD ON A SLED ON THE HIGH-SPEED TRACK, by Howard E. Carr (Alabama Polytechnic Inst.) and Howard G. Hanson (U. of Minnesota). Dec 60, 46p. 16 refs. AFOSR-TR-60-150; AD-248 579.
Order from LC mi$3.30, ph$7.80 PB 153 826

Various radioactive sources and means of signal detection are considered for use in the velocity measuring sensing head now used in the space-time system at the Holloman track. Numerous advantages and limitations of such sources and detectors are considered. The most attractive possibility is the use of a 1-curie gamma ray source in the 0.1 to 0.3 Mev range. To obtain a detector which is suitably rugged yet sensitive, modest development costs will be required. To date the best choice is a solid state photodetector with a luminescent crystal. Other detectors are too delicate or otherwise insufficiently developed at this time. A new method of space-time determination is proposed for use once the radioactive source technique is practicable. (Author)

Directorate of Research Analysis, Holloman AFB, N. Mex
STUDIES ON THE PROBLEM OF MONITORING THE PLATFORM ATTITUDE OF A SLED BY OPTICAL MEANS, by Gordon Hughes and Fred Allison, Alabama Polytechnic Inst. Dec 60, 25p. 2 refs. AFOSR-TR-60-149; AD-248 542.
Order from LC mi$2.70, ph$4.80 PB 153 825

Examination was made of several schemes, either proposed or currently under field test, for determining the orientation of a sled-carried platform in azimuth, pitch, and roll. Emphasis was placed on ar-

rangements permitting a continuous monitoring of the attitude of the platform by optical means during the whole of the motion of the platform along the track. (Author)

[Douglas Aircraft Co., Inc., Santa Monica, Calif.]
3-D TRAJECTORY SIMULATION FOR AERODYNAMICALLY CONTROLLED MISSILES, by T. J. Mueller, J. C. Walker and others. [Rept. on Contract DA 30-069-ORD-1448]. 8 Feb 60, 130p. 4 refs. A260-CETM-A06.0.
Order from LC mi$6.30, ph$19.80 PB 154 970

This report released for sale to the public 20 Mar 61.

Presented is the mathematical formulation of the trajectory simulation program A06.0 along with explanations of the geometry and mechanics involved. Where the derivation of equations is not straightforward, the derivations are presented.

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
ELECTROSTATIC SENSITIVITY OF 95/5 HMX/TITANIUM, 95/5 RDX/TITANIUM, 95/5 PETN/TITANIUM, AND COLLOIDAL LEAD AZIDE, by Anthony F. Taschler and Seymour M. Kaye. Jan 61, 119p. 1 ref. Technical notes FRL-TN-9.
Order from LC mi$2.40, ph$3.30 PB 153 627

The electrostatic sensitivity of the following physical mixtures was determined: 95/5 36-micron HMX (Lot DES-1)/7-micron titanium; 95/5 PETN (Lot 32)/7-micron titanium; 95/5 RDX (Lot PAE-11335)/7-micron titanium; and colloidal lead azide (Dupont). The energy level needed to ignite these four systems was found to be less than 0.0011 joule. The colloidal lead azide was most sensitive, and the RDX/titanium mixture least sensitive. (Author)

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
INFRARED PHOTOMETRIC METHOD FOR DETERMINING ALPHA AND GAMMA POLYMORPHS IN BETA HMX, by Frank Pristera, Walter E. Fredericks, and Michael Halik. Nov 60, 9p. Technical rept. FRL-TR-19; AD-248 550.
Order from LC mi$1.80, ph$1.80 PB 153 857

A method using infrared spectroscopy has been developed whereby the presence of 5% of the alpha or gamma polymorphs of HMX can be ascertained. The detection of 3% of these polymorphs can usually be achieved with some experience together with the use of prepared standards. The method uses a 5% mull of the sample in a 0.5-mm cell compensated with a 5% mull of pure beta HMX. The presence of alpha or gamma HMX produces an absorbance in the 14.0-to 14.3-micron region. (Author)

Frebank Co., Glendale, Calif.
DESIGN AND DEVELOPMENT OF NON-MODULATING PRESSURE CONTROL DEVICES, by Erhest A. Lamont and Melville D. Ferguson. Rept. on Contract AF 04(647)429, Phases I and II. Apr 60, 107p. Frebank rept. no. 160; AFBMD TN-60-18; AFBMD Doc. no. 60-4867; AD-239 181.
Order from LC mi$5.70, ph$16.80 PB 153 615

Effort is being made to show the adaptability of the snap action concept to a family of nonmodulating pressure control components for ballistic missile use. The snap action concept is essentially the utilization of the reverse spring rate achieved with properly designed belleville spring washers. Consideration was given to the desirability of the snap action concept for (1) relief valves, (2) pilot actuators, (3) high variation inlet pressure regulators, and (4) relatively constant inlet pressure regulators. The medium pressure switch operated satisfactorily at -423°F. Use of a pressure switch and solenoid valve to control tank pressure was satisfactorily demonstrated, and the effects of pressure switch deadband and solenoid valve delay were shown. A snap action pilot for a pressure actuated valve was proven as a nonmodulating regulator and as a relief valve. Both the regulator and relief valve controlled an ullage pressure satisfactorily. A nonmodulating helium regulator operating directly from the snap action device controlled ullage pressures satisfactorily. A nonmodulating direct acting regulator for large flows with relatively constant inlet pressures was tested. A large snap action device for mass flows higher than 0.25 lb/sec of hydrogen gas is considered feasible but not practical for airborne service. Use of the snap action concept as a direct acting relief valve was proven. Ullage pressure was satisfactorily controlled with nearly instantaneous opening and reseating within a narrow pressure deadband.

Frebank Co., Glendale, Calif.
THE DEVELOPMENT OF ADVANCED CRYOGENIC PRESSURE SWITCHES FOR BALLISTIC MISSILES, VOLUME I, by Ernest A. Lamont. Rept. on Contract AF 04(647)158. Mar 60, 172p. AFBMD TR-60-85; AFBMD Doc. no. 60-5488, vol. 1.
Order from LC mi$8.10, ph$27.30 PB 153 614-1

This report describes the research and development program required for the successful development of advanced cryogenic pressure switches. Two novel pressure switch concepts were discovered and proven experimentally. Advanced techniques of omnienvironmental testing were employed. A switch was developed that is adjustable between 100 and 1000 psia. Another switch developed is adjustable for actuation between 10 and 100 psig. Both switches have a unique deadband adjustability. (Author)

Frebank Co., Glendale, Calif.
THE DEVELOPMENT OF ADVANCED CRYOGENIC PRESSURE SWITCHES FOR BALLISTIC MISSILES, VOLUME II, by Matthew J. Farrell. Rept. on Contract AF 04(647)158. June 60, 93p. AFBMD TR-60-85; AD-243 423.
Order from LC mi$5.40, ph$15.30 PB 153 614-2

Development is reported of an advanced cryogenic low-pressure switch which functions essentially the same as the medium pressure switch previously developed (PB 153 614-1). The switch consists of 2 pressure-sensing diaphragms linked with an actuation shaft which rests against a stack of preloaded belleville

spring washers. The internal diaphragm senses operating fluid pressure, and the external diaphragm senses atmospheric pressure. The diaphragms have the same effective area so that the unit is a gage pressure sensing unit. The belleville spring washers are preloaded by a load adjustment ring to a given set pressure. Fluid enters the inlet port and pressurizes the internal diaphragm, causing a force to be developed on the belleville spring washer mechanism. At a preset actuation pressure, the mechanism becomes unstable and a snap-action deflection occurs, actuating a commercial electrical switching element which is converted to the electrical receptacle. The switch is adjustable between 10 and 100 psig and has a unique deadband adjustment. The switch successfully withstood the severe environmental conditions encountered in a ballistic missile by passing the Qualification Flight Rating Tests.

Massachusetts Inst. of Tech., Cambridge.
DEPOT SYSTEM SIMULATOR I. (ORDNANCE LOGISTIC STUDY), by Herbert P. Galliher and LeRoy H. Walker. Interim technical rept. no. 16 on Fundamental Investigations in Methods of Operations Research, Contract DA 19-020-ORD-2684. Sep 60, 61p. 1 ref. OOR rept. 968:31-M; AD-247 219.
Order from LC mi$3.90, ph$10.80 PB 153 660

A simulation program was constructed for the IBM 704 type computer, which operates a geographic complex of cooperating depots stocking a given item of supply for a captive demand. Stationary random demand patterns of selected types are allowed at each of the individual depots. Under appropriate controlled conditions, stocked depots cover customers of depots with depleted stocks while bulk interdepot shipments are made to preserve balanced distribution. Periodic or continuous review of stock in the total complex is used to generate and allocate constant-lead-time replenishments of total stock. The simulation output includes a tabulation of average stocks, out-of-stock frequencies, covering and balancing actions among the depots, and average delivery delays due to stock shortages. It also includes a tabulation of costs incurred in each individual type of supply action. (Author)

Minneapolis-Honeywell Regulator Co., Hopkins, Minn.
PROCESS DEVELOPMENT PROGRAM FOR THE EXPLOSIVE FORMING OF T54E1 MISSILE SKINS, by A. M. House. Final summary rept. on Contract DA 11-022-501-ORD-2662. 21 June 60, 71p. 33 refs. Technical document 42060; Serial no. 24905; AD-240 799.
Order from LC mi$4.50, ph$12.30 PB 154 769

This report released for sale to the public 15 Mar 61.

Studies were made of explosive forming techniques for the production of skin parts for the Little John missile. The best results were obtained when 6061 Al alloy preforms were solution heat-treated and then placed in a cold box until ready for forming. This aging process resulted in 6061-T6 tensile and yield mechanical properties which exceed values specified for the part. The dies were fabricated from 4140 cast steel with the die cavity machined to the nominal dimensions of the formed skin. The explosive charge was 39 in. of 100-grain Petn detonating cord. Water was used as the medium. Metallurgical examination showed the skins formed by this process consistently had better properties than those produced by other methods.

Naval Ordnance Test Station, China Lake, Calif.
DEVELOPMENT OF THE SIGNAL, FLASH, MK 49 MOD 0 FOR THE TERRIER BT-3 MISSILE AND THE SIGNAL, FLASH, MK 56 MOD 0 FOR THE CORVUS MISSILE, by J. W. Haldeman. Sep 60, 19p. 2 refs. NOTS TP 2452; NAVWEPS rept. 7055; AD-247 758.
Order from LC mi$2.40, ph$3.30 PB 153 487

The Signal, Flash, Mk 49 Mod 0 (Terrier BT-3) and Signal, Flash, Mk 56 Mod 0 (Corvus) were developed to evaluate the fuzes of the respective missiles. The design made each signal operable with the missile. The brilliant flash produced by the signal indicates fuze functioning in the telemetering head at the time the missile intercepts the target. In producing such a flash, the signals meet requirements of short functioning time, constant performance under all service conditions, and compatibility with their respective missiles. The signals are safe for handling and for use in the two missiles. Tests were carried out in more than 20 firings of the Terrier BT-3 missile. (Author)

Naval Weapons Lab., Dahlgren, Va.
EXPLOSION BULGE TEST EVALUATION OF HY-100 STEEL PLATES WELDED BY AIR REDUCTION COMPANY, INC., by W. H. Hall. 18 Nov 60, 32p. 5 refs. NWL rept. no. 1725; AD-248 067.
Order from LC mi$3.00, ph$6.30 PB 153 551

HY-100 steel material obtained from one inch and two inch thick plates was ballistically tested and subjected to experimental welding. The technique used in welding the subject specimens produced a generally satisfactory weld on the HY-100 steel plate material. The performance of welded HY-100 steel plates compares very favorably with that of HY-80 and STS weldments. Weld beads with smoother surfaces than those shown by the subject one inch specimens would provide welded structures with fewer stress-raisers when subjected to explosive loading. (Author)

Physical Sciences Lab., Ordnance Tank-Automotive Command, Center Line, Mich.
APPLICATION OF FLUOROSCOPY TO INSPECTION OF 20 mm FUZES, by Otto Renius and Gregory Arutunian. Oct 60, 30p. Rept. no. RR-29; AD-247 096.
Order from LC mi$2.70, ph$4.80 PB 153 447

Several methods of fluoroscopic viewing were investigated for 20 mm fuze evaluations. These included:
(a) Five-inch electronic image intensifier viewing.
(b) Nine-inch electronic image intensifier viewing.
(c) Closed-link image orthicon and vidicon viewing.
When X-ray generators operating in the range of 50 kvp to 200 kvp were used to irradiate the specimen fuzes, an operator was able to detect fuze components such as: firing pin, booster, detonator in the

rotor, and the position of the arming spring. Techniques of shielding, specimen rotation, and comparison of fuzes, were varied in an attempt to attain optimum sensitivity and ease of inspection. (Author)

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
GAS GENERATOR STUDIES FOR HAWK ELECTRICAL POWER UNIT, by L. Stiefel. Technical rept. Nov 59, 23p. 1 ref. Memo. rept. M60-14-1; AD-231 142.
Order from LC mi$2.70, ph$4.80 PB 153 944

A propellant charge was designed which would extend the operating time of the gas generators of the HAWK missile electrical power unit within the original space limitations. The design involved the use of a double base propellant, designated X-13. Two end-burning sticks are placed side by side and burned one after the other. A crossover arrangement to ignite the second stick after burnout of the first one was designed and tested. Furthermore, nylon-asbestos phenolic laminate HT 5000 was found to be a satisfactory insulating material to prevent premature ignition of the unburned charge. Several difficulties will, however, have to be overcome before the system is suitable for installation in a missile. A completely reliable inhibiting technique will have to be established. The temperature sensitivity of the propellant will require additional study to find the optimum operating pressure and, finally, a means of assembling and sealing the charges, which is compatible with the temperature cycling requirements of the unit, has not been developed. (Author)

Rock Island Arsenal Lab., Ill.
SIX YEAR STORAGE PROGRAM TESTS - PACKAGED ITEMS, by Linden H. Wagner. Final rept. no. 6E of 6 parts on Open, Underground, Shed and Warehouse Packaging Storage Tests. 2 Aug 60, 84p. Rept. no. 60-2313.
Order from OTS $2.25 PB 171 111

The results are given of the "Six Year Storage Program Tests - Packaged Items": (a) In open storage after 4 years at Rock Island Arsenal, Rock Island, Illinois; Red River Arsenal, Texarkana, Texas; San Jacinto Ordnance Depot, Channelview, Texas, and 3 years at the Naval Supply Depot, Bayonne, New Jersey; (b) In underground storage after 3 years at Natural Cooler (Cave) Storage, Atchison, Kansas; (c) In shed and warehouse storage after 8 years at Rock Island Arsenal, Red River Arsenal, San Jacinto Ordnance Depot, and 7 years storage at Bayonne. In evaluating the effect of the environment on the packaged items, open storage was the most severe; shed storage was next; warehouse and cave storage was the least severe. In comparing the severity of the exposure locations on the packaged items, Bayonne and San Jacinto (salt water sites) showed an increased effect. Red River Arsenal and Rock Island Arsenal (inland sites) were less severe, and Atchison, Kansas, (cave site) showed the least effects. (Author)

Rocketdyne [Canoga Park, Calif.]
DESIGN, DEVELOPMENT, AND TESTING OF ADVANCED LIQUID OXYGEN TANK VENT AND RELIEF VALVE, PART NO. 551430, by L. E. Tomlinson and R. H. Reinicke. Rept. on Contract AF 04(647)160. Mar 60, 230p. 5 refs. R-2175; AFBMD TR-60-55; AFBMD Doc. no. 60-2288.
Order from LC mi$9.90, ph$34.80 PB 153 612

The purpose of this program was to develop a component which would advance the state-of-the-art of liquid oxygen tank relief valves. The engineering analysis and design of the component are presented. A description of test facilities, procedures, and the results of development, performance demonstration, flight rating, and qualification testing is given and analyzed. Conclusions derived from test results and recommendations for future design improvements and applications are presented. (Author)

Robertshaw-Fulton Controls Co., Anaheim, Calif.
ANALYSIS, DESIGN AND DEVELOPMENT OF HIGH-FLOW HELIUM PRESSURE REGULATOR. VOLUME 1, by W. Thompson and F. Nepo. Rept. on Contract AF 04(647)161. June 60, 473p. 4 refs. AFBMD TR-60-72(1); AD-244 788.
Order from LC mi$11.10, ph$72.60 PB 153 617-1

The analysis, design, development, and test of a high-flow helium pressure regulator for ballistic missile use is presented. The following basic subdivisions are discussed: (1) an account of extensive dynamic control analyses performed on the developmental regulator systems using analog computers, (2) the design and development work, and (3) testing accomplished on various regulator configurations. (Author)

Robertshaw-Fulton Controls Co., Anaheim, Calif.
ANALYSIS, DESIGN AND DEVELOPMENT OF HIGH-FLOW HELIUM PRESSURE REGULATOR, VOLUME 2. Rept. on Contract AF 04(647)161. June 60, 333p. AFBMD TR-60-72(2); AD-244 789.
Order from LC mi$11.10, ph$51.60 PB 153-617-2

Presented are the results of two analytical studies of transient pressure response for charging and venting volumes through nozzles in various combinations. These studies are printed as a separate volume to permit them to be used as a handbook or reference guide when similar studies are being made. One section presents the study of a single volume connected through a nozzle to an infinite reservoir. The study covers the isothermal and adiabatic volume conditions for diatomic and monatomic gases, and includes a generalized problem solving method. Another section presents the study of two volumes interconnected in series with three nozzles and two infinite reservoirs. The study covers the isothermal conditions for a monatomic gas. (Author) (See also PB 153 617-1)

Systems Corp. of America, Los Angeles, Calif.
METHODS FOR THE CONTROL OF SATELLITES AND SPACE VEHICLES. VOLUME I: SENSING AND ACTUATING METHODS, by Robert E. Roberson, ed. Rept. for 30 June 59-31 July 60 on Stability and Control Investigations, Contract AF 33(616)6674. 31 July 60, 443p. 203 refs. WADD Technical rept. 60-463, Volume I.
Order from OTS $6.00 PB 171 496

A survey of sensors and actuators for the attitude control of space vehicles is presented with emphasis on the devices which presently appear to possess the greatest potential. Brief descriptions of each device are given along with published references where additional information can be obtained. Some of the newer sensing and actuating techniques, on which published information is inadequate, are analyzed in some detail. Recommendations regarding sensors and actuators are made and some development problems are described. (Author)

Systems Corp. of America, Los Angeles, Calif.
METHODS FOR THE CONTROL OF SATELLITES AND SPACE VEHICLES. VOLUME II. CONTROL SYSTEM MECHANIZATION AND ANALYSIS, ed. by Robert E. Roberson. Rept. on Stability and Control Investigations, Contract AF 33(616)6674. 31 July 60, 300p. 183 refs. WADD Technical rept. 60-643, vol. 2.
Order from OTS $4.00 PB 171 553

Information of importance to the synthesis of space vehicle attitude control systems is presented. This includes: (1) Survey of recent published literature on complete attitude control systems. (2) Abbreviated survey of the aspects of control theory which may be of particular interest for space vehicle attitude control (3) Development of the basic attitude equations of motion. (4) Investigation of inertial actuator tradeoffs. (5) Some basic studies in synthesis. (6) System response studies with the analog computer. (Author)
(See also PB 171 496)

Sanitation and Safety Engineering

Naval Civil Engineering Lab., Port Hueneme, Calif.
FEASIBILITY OF FLOTATION CLARIFICATION FOR WATER TREATMENT, by J. E. Halton, W. R. Nehlsen, and J. V. Graham. Final rept. Technical rept. 103; AD-248 070.
Order from LC mi$2.40, ph$3.30 PB 153 610

The feasibility of expanding the application of the flotation process for waste-water clarification to turbid water was studied. A 5-gpm experimental water-treatment flotation clarifier was constructed and used to treat naturally and artificially turbid waters. Experiments also were made to show the effects of water alkalinity variations on the process. Retention times of about 20 minutes in the clarifier were satisfactory and process control using pH meters was reliable. Alum dosages of about 10 gpg and sodium hydroxide dosages of 2.5 gpg were required for the water tested. When the water to be treated contained sufficient natural carbonate alkalinity, it was not necessary to use sodium hydroxide. Because of high chemical requirements, the process is not considered suitable for further development. (Author)

Naval Radiological Defense Lab., San Francisco, Calif.
THE SHELTER OCCUPANCY TEST OF 3-17 DECEMBER 1959, by W. E. Strope, H. S. Etter and others. Preliminary rept. 4 May 60, 93p. 2 refs. Research and development technical rept. USNRDL-TR-418; AD-237 130.
Order from LC mi$5.40, ph$15.30 PB 154 503

This report released for sale to the public 1 Mar 61.

The USNRDL experimental shelter at Camp Parks, California, was occupied continually for a period of 2 wk by 100 male volunteers. During this period, all aspects of the shelter environment were monitored as well as the actions and responses of the shelterees. Shelter facilities were tested, the effectiveness of a proposed shelter organization and procedures were evaluated, and the palatability and preparation procedures of several food rations were evaluated. This is a preliminary report made in advance of complete analysis of the data. (Author)

Ship Building

Illinois U., Urbana.
BEHAVIOR OF RIVETED AND WELDED CRACK ARRESTORS, by R. J. Mosborg. Final rept. on Contract NObs-65789. 31 Aug 60, 134p. 22 refs. Ship Structure Committee serial no. SSC-122; AD-242 415.
Order from OTS $2.75 PB 171 576

Laboratory work was undertaken (1) to investigate the feasibility of developing a welded crack arrestor and (2) to observe the behavior of various crack arresting devices. The study was accomplished by propagating a brittle crack, initiated by driving a wedge into a notch at the edge of the specimen, into 2-ft and 6-ft wide steel plates containing either (a) welded inserts of T-1 steel (b) riveted doubler plates or (c) welded inserts of ABS Class C normalized steel, which were located at various distances from the edge of the plate. Most of the tests were conducted at nominal stresses between 20 and 30 ksi and at temperatures between -25 and 40 F. The progress of the crack and the extent of its penetration in the T-1 steel insert depended primarily on the severity of the resulting eccentric load and the width of the arrestor material. The average speed of brittle crack propagation was generally between 2800 and 3800 fps and that little change occurred in the strain across the uncracked portion of the plate beyond the localized influence of the crack front. A riveted doubler plate was shown to be an excellent form of arrestor if the discontinuity produced by the slot in the main plate beneath was present. However, the rivet holes did not necessarily attract propagating cracks. In tests of specimens with ABS Class C normalized steel as the arrestor material, a brittle crack which had propagated 12 in. was either completely accepted or refused by the strake of killed and normalized steel; this transition in behavior occurred between 10 and 35 F. (Author)

National Research Labs., Ottawa (Canada).
COMPUTING EFFECTIVE POWERS AND ASSOCIATED COEFFICIENTS FROM SHIP MODEL RESISTANCE TESTS, by P. G. Morel. Sep 60, 76p. Mechanical engineering rept. MB-226.
Order from LC mi$4.50, ph$12.30 PB 154 057

A detailed description is given of the program for analyzing the results of a resistance test of a ship model, using the Bendix G-15D digital computer. The flexibility of entering the input data allows output data for any size of model or ship in salt or fresh water at any temperature, and also allows for different skin roughnesses and for the introduction of a form factor. Besides absolute values for resistance, power, and speed, various coefficients are given. The possibility of calculating the tow-rope force correction for a self-propulsion test is also incorporated. (Author)

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Engines and Propulsion Systems

Aeronautical Research Lab., Air Force Research Div., Wright-Patterson AFB, Ohio.
THEORETICAL CONSIDERATION OF NONUNIFORMLY CHARGED EXPELLANT BEAMS, by Robert E. Hunter. Rept. for June-Aug 60 on Ion Propulsion Technique Research. Oct 60, 18p. ARL Technical note 60-138.
Order from LC mi$2.40, ph$3.30 PB 150 320

Non-uniformity of charge-mass ratio in the expellant beam of electrostatic thrust devices is shown to be expressible as a power efficiency factor. Non-uniformity in ion beams, in the form of neutral atoms and multiply charged ions, is examined and the conclusion is drawn that the existence of multiply charged ions in the specie percentages which reasonably can be expected from non-contact ion sources is not a serious problem. Presently available experimental data indicate that the colloid thrust devices will produce particles with a wide range of charge-mass ratio, possibly including ions. A generalized exponential form is assumed for the mass distribution function in terms of charge-mass ratio. The beam efficiency is shown to be critically dependent upon the range of charge-mass ratio in the beam. The presence of ions in the colloid beam is shown to be an additional serious factor. Non-uniformity of charge-mass ratio in colloid expellant beams may be serious enough to require the expellant beam to be filtered, for example, by a magnetic deflection, to recover the mass carried by neutral and slightly-charged particles. In addition, the energy carried by the ions may have to be recovered. (Author)

James Forrestal Research Center, Princeton, N. J.
PROJECT SQUID. Semi-annual progress rept. for 1 Oct 59-31 Mar 60 on Contract Nonr-1858(25). 1 Apr 60, 102p. 49 refs. AD-236 163.
Order from LC mi$5.70, ph$16.80 PB 154 104

Contents:
Fundamental investigation of nonsteady flow
Investigation of turbulence
Investigations in magnetohydrodynamics
Thermal conductivity and the viscosity of ammonia and hydrazine
Thermal conductivity of gases and liquids over a range of temperatures and pressures
Elementary reactions in combustion
High temperature reactions
Surface-catalyzed atom and free radical reactions
Investigation of reaction kinetics in high-temperature gases
Inelastic molecular collisions
Solid-propellant flame mechanisms
Ignition by hot gases, and initiation of detonation by electric spark
Investigation of transport properties at high temperature and of gaseous combustion
Ionization in detonation waves
Total radiation from burning solid propellant strands
Turbulent flame thermometry
Plasmaflow in nozzles

(See also PB 152 155)

Naval Ordnance Test Station, China Lake, Calif.
A SYSTEM FOR CORRECTING FOR SPURIOUS NATURAL-FREQUENCY RINGING OF ROCKET STATIC THRUST STANDS, by John S. Ward. Rept. for 24 July-5 Sep 59. 1 Sep 60, 20p. NOTS TP 2541; NAVWEPS rept. 7569; AD-246 982.
Order from LC mi$2.40, ph$3.30 PB 153 449

A model was designed to demonstrate the feasibility of a data-combination system for a large rocket-motor static-test stand. This data-combination system was designed to eliminate effects of stand vibrations on the thrust load-cell data--the effects occurring due to the low natural frequency of the stand. The system employs an accelerometer to indicate the motion of the rocket motor due to changes in thrust or stand vibrations as the motor deflects the thrust load cell. The accelerometer signal is 180 degrees out of phase with the thrust-load-cell signal; when the two signals are added together, the effects of spurious stand vibrations are eliminated. The functioning of the data-combination system was demonstrated by the model within the accuracy of the experimental equipment used. It was also found that accelerometer phase shift will be a major problem in this system, depending upon accuracy requirements. To maintain an accuracy of 0.1% for this model system, an accelerometer with a natural frequency of 9, 820 cps or above is required. (Author)

Ultrasonic Testing and Research Lab. [Paramount, Calif.]
APPLICATION OF ULTRASONICS TO SOLID ROCKET SYSTEMS, by R. E. Kleint, R. D. McKown, and J. B. Ramsey. Rept. for June 59-Aug 60 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)6603. Oct 60, 115p. 7 refs. WADD Technical rept. 60-553; AD-249 103.
Order from OTS $2.50 PB 171 499

This report contains the results of investigations to establish the applicability of ultrasonic inspection

techniques to solid fuel rocket motors. Special emphasis was placed on the detection of unbonded areas at the interfaces of solid fuel rocket motors having a basic construction of a steel case, rubber liner and solid propellant bonded together in that order. The acoustic properties were obtained for these and other materials used for construction of rocket motors. Commercially available ultrasonic inspection and recording equipment was used to obtain data. Various pulse-echo and through-transmission techniques were utilized to determine optimum conditions for detecting defects and displaying them on both cathode ray image and C-Scan (plan view) facsimile paper recordings. (Author)

Machine Parts and Mechanisms

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
REFINEMENTS OF THE THEORY OF THE INFINITELY-LONG, SELF-ACTING, GAS-LUBRICATED JOURNAL BEARING, by Harold G. Elrod, Jr. and Albert Burgdorfer. Interim rept. on Contract Nonr-2342(00). Jan 60, 50p. 11 refs. I-A2049-10; AD-232 705.
Order from LC mi$3.30, ph$7.80 PB 155 001

This report released for sale to the public 16 Mar 61.

The lubrication equations for an arbitrary Newtonian fluid are derived directly from the general equations for conservation of mass, momentum, and energy. From the lubrication equations an inequality is obtained for the internal film temperature rise. The isothermal film equations are derived, and for perfectly-aligned self-acting journal bearings, a conservation equation is obtained. Application of this condition to the infinitely-long gas bearing gives more accurate pressure solutions for this case. The Katto-Soda form of the differential equation for the infinitely-long bearing is solved by a series expansion in the eccentricity ratio, the first terms of which give the original, approximate Katto-Soda solution. In addition, solutions obtained numerically by digital computations are presented in graphical and tabular form for eccentricity ratios from $0 \rightarrow 0.9$ and compressible bearing parameter, λ_1 from $0 \rightarrow \infty$ (Author)

General Electric Co., Schenectady, N. Y.
GAS BEARING STABILITY STUDY; VERTICAL ROTOR INVESTIGATION, by R. C. Elwell, R. J. Hooker, and R. Sternlicht. Technical rept. on Contract Nonr-2844(00). 20 May 60, 62p. 5 refs. AD-237 432.
Order from LC mi$3.90, ph$10.80 PB 148 011

An analytical and experimental study of the stability of vertical rotors, supported by self-acting gas bearings, is reported. Three main groups of results are presented: (1) Forced vibration of an unbalanced rotor. (2) Unstable rotors with flexible drive. (3) Instabilities of a direct driven (integral electric motor) rotor. Methods of calculating forced vibration amplitudes due to unbalance are presented, based on previous analytical work, and supported by the experiments reported. The unstable behavior of a variety of rotors is presented, to illustrate the commonness of half-frequency conical whirl, and its persistence. Methods of calculating the "threshold of half-frequency whirl" are given, and verified by experimental results obtained on three different rotors. The technique predicts the mole of whirl to be encountered, and is a useful design tool. (Author)

Manufacturing Equipment and Processes

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON LERNER AND SAMUELSON'S THEOREM IN NONLINEAR PROGRAMMING, by Hirofumi Uzawa. Technical rept. no. 79 on Contract Nonr-225(50). 25 Mar 60, 21p. 12 refs. AD-235 143.
Order from LC mi$2.70, ph$4.80 PB 153 690

Lerner and Samuelson's principle of complete factor equalization is formulated in terms of activity analysis, and the range of factor endowments is characterized for which imputed prices of factors are identical. In the case of (strictly) diminishing returns to scale and diminishing marginal rates of substitution, factor prices are equalized if and only if factor endowments are the same. In the case in which constant returns to scale prevail, the range of factor endowments with the same factor prices is determined by optimum factor requirements in various industries. The criteria for equalization of factor prices are given without reference to non-specialization of activity levels, as required in the Samuelson analysis. The application of the analysis to the factor price equalization in international trade is not so transparent. The domain of factor endowments for which factor price equalization takes place is determined relatively to commodity prices, which in turn reflect the interaction of both demand and production structure of each country. The condition under which factor prices are equalized by free trade in commodities is not characterized. (Author)

National Research Council, Washington, D. C.
MANUFACTURING IN THE CONCEPCIÓN REGION OF CHILE. PRESENT POSITION AND PROSPECTS FOR FUTURE DEVELOPMENT, by Joseph H. Butler. Doctoral thesis. Rept. no. 7 on Foreign Field Research Program, Nonr-2300(09). 1960, 115p. 82 refs.
Order from LC mi$6.00, ph$18.30 PB 153 763

Contents:
The manufacturing region delimited and its geographical setting described
Industrial history of the region
The existing manufacturing industries
Characteristics of production in the region
Local extractive industries as sources of raw materials and fuel
The availability of electric energy
The influence of physical site factors
The influence of transportation
The region's population growth and general economic development

Availability of products, services, and other requirements for use in manufacturing
The influence of markets
The influence of labor
The availability of capital
A synopsis of the outlook for future development of manufacturing

Princeton U., N. J.
PRODUCTION CHANGE COSTS AND THEIR EFFECT UPON INVENTORY AND PRODUCTION POLICY, by Daniel Orr. Research memo. no. 15 on Econometric Research Program, Contract Nonr-1858(16). 13 May 60, 88p. 30 refs. AD-240 299.
Order from LC mi$4.80, ph$13.80 PB 149 155

Chapter I has four main purposes: the first is to describe the problems encountered in dealing with the type of production change cost visualized in this study; the second is to describe two rigorous analytic methods (the recursive functional equation approach of dynamic programming, and the standard method of obtaining the stationary distribution of a Markovian inventory process) which have been successfully used in conjunction with other inventory policies and which have been considered as possible approaches to the present problem; the third is to describe certain approximation techniques which have served to simplify the computational problems frequently encountered in dealing with inventory processes; and the fourth is to review that portion of earlier work in which different formulations of production change cost appear. In Chapter II the new production policy is described, and in an appendix the attempts to analyze this policy by rigorous analytic methods are reproduced. The approximations based upon sequential analysis are developed and suggested as an alternative when more rigorous analysis is not successful. Chapter III is an investigation of production cost and production change cost. Support is developed for the contention that production change costs will depend (a) upon the frequency of production changes, and (b) upon the number of different production rates specified by the policy. Chapter IV is concerned with methods for determining when the new policy is suitable for use; several important questions regarding its form are answered. It is also appraised from the standpoint of application. (Author)

Transport, Traction and Hoist Facilities

Dynamic Simulations Lab., Ordnance Tank-Automotive Command, Center Line, Mich.
DIGITAL COMPUTER PROGRAM. DRAWBAR PULL PREDICTION WHEELED VEHICLES, by Howard C. Mottin. 15 Nov 60, 28p. 1 ref. Rept. no. RR-30; AD-248 004.
Order from LC mi$2.70, ph$4.80 PB 153 562

A digital computer program is presented for determining the drawbar pull or gradeability of a wheeled vehicle with either a standard or automatic transmission. (Author)

Ordnance Test Activity, Yuma, Ariz.
PLASTIC FABRIC (VINYL NYLON) VEHICLE TARPAULINS, by Leo C. Graff. Final rept. for 26 May-20 Nov 59. Jan 60, 15p. 3 refs. Rept. no. OTA/TB5-1401/483; TW-601/15; AD-231 299.
Order from OTS $0.50 PB 171 525

Plastic fabric (vinyl nylon) tarpaulins were installed on an M35E7 truck and on an M105 trailer which were then operated approximately 1300 mi to evaluate the suitability of the tarpaulin as a protective cover for cargo vehicles. The test item was easier to handle and install than the standard tarpaulin and no abnormal wear or deterioration resulted from exposure to high ambient temperatures during vehicle operation on paved and secondary roads. Further tests are recommended to determine the durability of the vinyl nylon fabric and the feasibility of using this fabric as a covering for the cabs of Ordnance vehicles which presently employ a canvas top. (Author)

Transportation Center, Northwestern U., Evanston, Ill.
TRANSPORTATION GEOGRAPHY RESEARCH. Preliminary rept. on Contract DA 44-177-tc-574. 1 July 60, 152p. Proj. 9R99-01-004/HT17.13.
Order from LC mi$7.50, ph$24.30 PB 153 605

This report released for sale to the public 15 Mar 61.

A preliminary report is given of fundamental research relating to areal distributional aspects of transportation resources, oriented toward the development of transportation forecast methodology. The study investigates (1) the relation between economic development, natural environment, and the physical development of transportation stock aggregates; and (2) the relation between the location of activities, natural environment, and the spatial distribution of transportation facilities. Transport systems of many countries are compared at one point in time and a single country is examined over time. An "ideal-typical" historical sequence of transport development is hypothesized and examined, and individual-country studies are made relating the growth of population and production centers to transport networks. First approximations of key variables and their relative importance are stated. Data weaknesses are identified and suggestions are made regarding necessary refinements in data and techniques for further progress toward predictive models. (Author)

MATERIALS

Bausch and Lomb Optical Co., Rochester, N. Y.
INFRARED COATING STUDIES, by A. Francis Turner. Quarterly technical rept. no. 3A, 23 Apr-22 July 59, on Contract DA 44-009-eng-3230. 15 Sep 59, 26p. AD-227 703.
Order from LC mi$2.70, ph$4.80 PB 153 920

This report released for sale to the public 15 Mar 61.

Further investigations were carried out in the employment of PbTe as a filming material. This consisted in the fabrication of a series of nine layer low pass filters, a series of band pass filters in the ten micron region as well as absorption filters utilizing the intrinsic absorption of the PbTe. Combined with this was a study of the effect of the substrate index on the windows of low pass filters. (Author)

Horizons, Inc., Cleveland, Ohio.
MECHANISM OF GROWTH AND PHYSICAL PROPERTIES OF REFRACTORY OXIDE FIBERS, by Andrew L. Cunningham. Final rept. on Contract Nonr-2619(00). 14 Apr 60, 57p. 4 refs. AD-240 892.
Order from OTS $1.50 PB 171 520

A study was made of the growth and properties of refractory oxide fibers as formed from the vapor phase in the case of Al_2O_3, and from colloidal suspensions in the case of ZrO_2, SiO_2 and related fibers. The vapor phase method entails the heating of high purity aluminum melts under carefully controlled conditions in a hydrogen atmosphere. The presence of controlled amounts of moisture facilitates the formation of a volatile and relatively stable suboxide of aluminum. The second approach is based upon rapid drying of stabilized colloidal suspensions which result in a fibering reaction. The resultant fibers are heat-treated and are thus rendered thermally and mechanically stable. Physical testing was limited to maximum tensile strength determinations. The indicated tensile strengths of Al_2O_3 fibers are much in excess of those in the literature. Mechanical properties and high thermal stability of both groups of fibers attribute to them a significant superiority to all other fibers in this category. (Author)

McGraw-Hill Book Co. [Inc., New York].
HANDBOOK OF FIBROUS MATERIALS, by Harry Mileaf. Rept. for July 58-July 60 on Materials Application, Contract AF 33(616)5726. Oct 60, 495p. 19 refs. WADD Technical rept. 60-584.
Order from OTS $6.00 PB 171 494

This report contains the summarized and consolidated information extracted from WADD Technical Reports covering several phases of fibrous materials research. The information is arranged to make the results of these reports more readily available and useful to decelerator designers and others interested in the fibrous materials phase of Air Force research. The report is divided into sections covering the pertinent facets of fibrous material information. Fairly complete information is supplied on various phases of basic design data, sewability, friction, abrasion and weather resistance, porosity and air permeability, temperature properties and chemical resistance of different yarns, cords, webbings and fabrics. Some information is also supplied on sunlight and weather resistance, tear resistance, radiation, aging and electrostatic properties, stiffness, flexibility, elongation, elastic recovery and energy absorption. (Author)

Naval Radiological Defense Lab., San Francisco, Calif.
THE MECHANISMS OF IGNITION OF CELLULOSIC MATERIALS BY INTENSE THERMAL RADIATION, by S. Martin. 10 Feb 56, 43p. 78 refs. Research and development technical rept. USNRDL-TR-102; AFSWP-799; AD-108 394.
Order from LC mi$3.30, ph$7.80 PB 154 754

This report released for sale to the public 15 Mar 61.

Existing information about the processes occurring in a cellulosic solid undergoing pyrolysis is summarized with attention directed toward possible changes in reaction mechanism with increased heating rates. The significance of such mechanism changes in regard to the ignition event is discussed. The properties and rate behavior characteristics of gas phase oxidation reactions are presented along with some examples of analytical expressions describing the temperature-concentration profiles in the system. The combination of heat and mass transfer with classical reaction kinetics is suggested as a powerful tool for uncovering the fundamental processes involved in the ignition of cellulose by intense radiant energy. (Author)

Pennsylvania State U., University Park.
SCABBING AND FRACTURE OF MATERIALS BY STRESS WAVES, by Norman Davids. Final rept. for 1955-1960 on Contract DA 36-061-ORD-465. 15 Sep 60, 10p. OOR rept. 1253:20; AD-246 136.
Order from LC mi$1.80, ph$1.80 PB 153 661

This project has been concerned with a theoretical investigation of "scabbing" in materials. Its scope has included an analysis of wave propagation effects and reflection at free surfaces. Due to the broad nature of this scope the work naturally divided into (A) Elastic problems, (B) Plastic problems. Under "scabbing phenomena" or spalling, were included in this study various related types of damage embracing cracking as a result of destructive interference by stress waves. Under (A) linear behavior was assumed (justified by many materials, both metal and non-metal) while (B) dealt with more general stress-strain and failure criteria. (Author)

Adhesives and Sealants

Minnesota U., Minneapolis.
AN INVESTIGATION OF LONGITUDINAL SHEAR DISTRIBUTION AND DAMPING IN A VISCOELASTIC ADHESIVE LAP JOINT, by Carlos P. Avery. Rept. for June 59-July 60 on Metallic Materials, Contract AF 33(616)6828. Nov 60, 40p. 5 refs. WADD Technical rept. 60-687.
Order from OTS $1.00 PB 171 556

An analysis of the damping in a viscoelastic adhesive of a simple lap joint is presented. Expressions are developed for shear distribution and damping in the adhesive when the lap is sheared by a low frequency sinusoidal force. Calculations are made illustrating the variation in damping and shear distribution as a function of the dimensions and material properties of the lap components. Experiments were performed which confirm the theory. Limitations, extensions, and possible refinements of the theory are presented. (Author)

Naval Research Lab., Washington, D. C.
AN ISOCYANATE PRIMER-SEALER FOR MASONRY, by J. R. Griffith and G. E. Rohl. 30 Jan 61, 18p. 4 refs. NRL rept. 5580.
Order from OTS $0.50 PB 171 107

A new primer-sealer has been developed for use on a variety of weathered masonry surfaces. It contains a commercially available material of the isocyanate type which has previously been adapted to use as a bonding coat in the application of organic linings to the interior surfaces of large, concrete, fuel storage tanks. A program is in progress in which the isocyanate primer shows promise for use as a base coating on various masonry surfaces prior to the application of acrylic emulsion paints. (Author)

Ceramics and Refractories

Chicago Midway Labs., U. of Chicago, Ill.
RESEARCH ON NON-OXIDE GLASSES, by W. A. Fraser. Final rept. on Contract DA 44-009-Eng-3702. July 59, 55p. 24 refs. CML-TR-P153-12; AD-231 071.
Order from OTS $1.50 PB 171 526

The work of preparing new glasses involved two types of operations which progressed somewhat independently of each other. One type of operation was required for preparing specific compounds suitable for combining into glasses. The second type was the melting of the mixtures of the compounds to form glasses. The techniques of producing the sulfides and selenides were developed so that most of the preparations are now routine in nature. One or two of the preparations still present some problems which have not been completely investigated. However, the majority of the compounds can be prepared quite simply and no new development is required with respect to these materials. This phase of the program can be considered to have been satisfactorily completed. The program on the development of new non-oxide glasses produced two new glass fields, the calcium thiogallate glasses and the calcium thioaluminate glasses. A few glasses in a third field of the calcium selenogallates were prepared. As is true in all new glass fields, more research and development work is required to produce stable compositions suitable for large melts and for weather stability. When the amount of time spent on this development is considered, it is believed that a satisfactory start has been made in the development of new glasses with very good thermal properties. A few years ago, it was considered unlikely that non-oxide glasses with annealing and softening temperatures above 500°C could be developed. Glasses in the two new glass fields have annealing temperatures over 500°C. (Author)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
STUDY AND PRELIMINARY EVALUATION OF CERAMIC BRAKE FRICTION MATERIALS FOR AIRCRAFT, by W. F. Zenoni and J. D. Walton. Rept. for 15 Apr 57-14 Apr 58 on Carriage Systems, Contract AF 33(616)5191. Apr 58, 32p. WADC Technical rept. 58-118.
Order from LC mi$3.00, ph$6.30 PB 154 751

This report released for sale to the public 15 Mar 61.

A laboratory friction material brake tester was designed and fabricated. This tester places a dynamic test on the sample rather than a drag test, therefore more closely simulates a braking process. Samples utilizing zirconia and fused silica as the main ceramic body were fabricated. An organic resin and commercially available colloidal silica were studied as impregnants for the silica base samples. Silica base sample compositions were varied by the addition of fused alumina, calcined alumina and clay. Silica samples impregnated with colloidal silica showed considerably better wear resistance than silica samples impregnated with an organic resin. Silica samples with refractory additions showed friction properties and wear resistance that compared very well with those of organic friction material presently being used in aircraft brakes. A new type of cermet designated thermitic cermet was included in the test program. Test data were insufficient to permit proper evaluation of this cermet as a brake friction material. (Author)

Little, Arthur D., Inc., Cambridge, Mass.
INFRARED SPECTRAL EMITTANCE PROPERTIES OF SOLID MATERIALS, by Henry H. Blau, Jr., John B. Marsh and others. Final rept. on Contract AF 19(604)2433. Oct 60, 84p. 7 refs. AFCRL-TR-60-416; AD-248 276.
Order from OTS $2.25 PB 171 515

Attempts to utilize a solar furnace for high-temperature emittance and reflectance measurements were almost completely unsuccessful. The basic problems encountered were instabilities in specimen temperature and instabilities in incoming solar flux. The two are clearly closely related. At least some of these difficulties could be overcome by substituting a well-stabilized arc furnace for the solar furnace.

National Bureau of Standards, Washington, D. C.
PHYSICAL PROPERTIES OF HIGH TEMPERATURE MATERIALS. PART V. THERMAL DIFFUSIVITY OF MAGNESIA-STABILIZED ZIRCONIUM OXIDE AT HIGH TEMPERATURES, by Howard W. Flieger, Jr., Friedrich P. Knudsen, and Defoe C. Ginnings. Rept. for 31 Mar 57-21 Dec 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)56-21. Oct 60, 19p. WADC Technical rept. 57-374, pt. 5.
Order from OTS $0.50 PB 171 541

As a part of a program developing standards of thermal conductivity and thermal diffusivity of refractory materials at high temperatures, thermal diffusivity measurements have been made on dense polycrystalline zirconium oxide which had been stabilized with magnesium oxide. The results indicate that the stabilization of the zirconium oxide was inadequate, giving progressively increasing values of thermal diffusivity after cycling to temperatures of about 1200°C. Thermal expansion and X-ray measurements indicated that the increase in thermal diffusivity values corresponded to a change from cubic to monoclinic crystalline form. (See also PB 140 817)

Naval Research Lab., Washington, D. C.
PROTECTION OF REFRACTORY METALS FOR HIGH TEMPERATURE SERVICE. PROGRESS REPORT 1, JULY 1, 1960: THE ZINC-BASE COATING FOR NIOBIUM, by B. F. Brown, R. A. Meussner and others. 28 Nov 60, 37p. 1 ref. NRL rept. 5550.
Order from OTS $1.00 PB 161 932

The protective action of a zinc-base coating on niobium is due to the formation of a tight layer of ZnO. Any breaks occurring in the oxide barrier are self-healed by the formation of additional ZnO resulting from the reaction of air with zinc vapor arriving from zinc-rich intermetallic compounds between the oxide barrier and the niobium. The zinc-niobium phase diagram has been determined sufficiently well to place the temperature limitation of the coating at 2048°F, at which temperature the most stable niobium-zinc compound decomposes. Alloy additions have not raised this ceiling while at the same time retaining the self-healing properties. No other metals have been found which are as satisfactory as zinc in forming protective coatings for niobium. Furthermore, it appears that zinc is as suitable for niobium alloys as it is for pure niobium, unless these contain high percentages of vanadium. Complex shapes can be vapor coated, but this process does not permit the admixture with the zinc of small amounts of aluminum, titanium, and zirconium, which appear desirable for reliability, particularly in the range 1800° to 2000°. (Author)

Naval Research Lab., Washington, D. C.
PROTECTION OF REFRACTORY METALS FOR HIGH TEMPERATURE SERVICE. PROGRESS REPORT 2, OCTOBER 1, 1960: DURABILITY OF THE ZINC-BASE COATING FOR NIOBIUM, by B. F. Brown, R. A. Meussner and others. 31 Jan 61, 27p. 2 refs. NRL rept. 5581.
Order from OTS $0.75 PB 171 159

The effects of the coating thickness, the method of application and the temperature of application of the coating, the composition of the compounds, the temperature of the test, and thermal cycling have been examined in life tests lasting approximately 1000 hours. The beneficial effects of titanium and aluminum in the coating have been indicated and the effects of some transition metal additions are briefly reported. Some additional data are presented on the niobium-zinc system. The report also includes some observations of the redistribution of interstitial impurities in the niobium as a result of the coating and testing procedures and the results of exploratory studies on the oxidation of titanium-zinc and nickel-zinc alloys. (Author) (See also PB 161 932)

New Jersey Ceramic Research Station, Rutgers [State] U., New Brunswick.
THE GROWTH AND INVESTIGATION OF FERROELECTRIC AND ANTIFERROELECTRIC CRYSTALS, by Etsuro Sawaguchi and Melvin L. Charters. Final technical rept. for 1 Sep 56-31 Aug 57 on Contract DA 36-039-sc-70137. Aug 57, 97p. 20 refs. AD-149 504.
Order from LC mi$5.40, ph$15.30 PB 150 899

Contents:
Peculiar hysteresis behavior of $Pb_{0.5}Ca_{0.5}TiO3$
Effect of small additions of Ta, Cu, and Pb on the dielectric properties of cadmium niobate
Effect of polarization reversal on the dielectric constant of barium titanate
Automatic bridge for measuring dielectric constant
Study preparatory to the nuclear magnetic resonance of cadmium niobate

New York State Coll. of Ceramics, Alfred U.
METAL FIBER REINFORCED CERAMICS, by J. R. Tinklepaugh, B. R. Goss and others. Rept. for 1 Sep 59-31 Aug 60 on Ceramic and Cermet Materials Development, Contract AF 33(616)5298. Nov 60, 89p. 18 refs. WADC Technical rept. 58-452, pt. 3.
Order from OTS $2.25 PB 171 550

The flexural properties of a ceramic-metal fiber system were studied and it was found that the metal fiber does assume a part of the load which is to some degree in proportion to the relative elasticity moduli of the ceramic and metal. The test data for the alumina-molybdenum and alumina-mullite-molybdenum systems were extended to 3000°F. Hafnium oxide was found to have desirable characteristics for use in a composite system. (Author) (See also PB 161 481)

Stanford Research Inst. [Menlo Park, Calif.]
MECHANICAL PROPERTY SURVEY OF REFRACTORY NONMETALLIC CRYSTALLINE MATERIALS AND INTERMETALLIC COMPOUNDS, by William D. Smiley, Leon E. Sobon and others. Rept. for 15 June 58-15 June 59 on Solid State Research and Properties of Matter, Contract AF 33(616)5907. Jan 60, 333p. 1201 refs. WADC Technical rept. 59-448; AD-234 775.
Order from LC mi$11.10, ph$51.60 PB 154 846

This report released for sale to the public 16 Mar 61.

The literature on the mechanical properties of nonmetallic polycrystalline compounds and intermetallic compounds with melting points above 1500°C was surveyed. The theoretical concepts of flow and fracture were reviewed. It was determined that the mechanical properties of many potential high temperature materials have not been evaluated. It was concluded that the intermetallic compounds which are brittle at room

temperature and slightly ductile at high temperature (where some of them are also stronger) are more worthy of future study than the much worked-over oxides and interstitial compounds. Another conclusion of this study was that conventional parameters, such as tensile strength, etc., may not be of value for designing high temperature structural components, and that data from tests closely simulating actual use conditions are necessary before the designer can confidently use brittle materials. (Author)

Fuels, Lubricants, and Hydraulic Fluids

Phillips Petroleum Co., Bartlesville, Okla.
CHEMICALLY REACTIVE SPECIES: THEIR PRODUCTION, STABILIZATION, CONCENTRATION AND STORAGE, by Raymond L. Arnett, Eugene D. Guth, and Julius R. Berreth. Final rept. on Contract AF 49(638)45. Oct 59, 41p. 10 refs. Research Div. rept. no. 2478-59R; AFOSR-TR-59-190; AD-235 428.
Order from LC mi$3.30, ph$7.80 PB 150 072

The continual search for higher energy propulsive fuels has fostered research on the generation and stabilization of free radicals. The radicals are generated in situ in solids by gamma irradiation. The solids are condensed low molecular weight gases. The energy stored in these systems is measured by direct calorimetric observations of the apparent heat capacity of the irradiated material as compared to that for the unirradiated material. The apparatus for making these measurements is described and a summary discussion of the results is given. Curves are given showing the the energy released as the solid is warmed for each system examined. (Author)

Propulsion Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
IMPROVEMENT OF THE STORAGE LIFE OF MIL-L-7808 OILS, by Eldred N. Cart. Rept. on Aviation Lubricants. Jan 59, 41p. WADC Technical rept. 59-379; AD-225 033.
Order from LC mi$3.30, ph$7.80 PB 154 969

This report released for sale to the public 16 Mar 61.

Different additives were tested in MIL-L-7808 oils to see if they would increase the storage life of the synthetic oil. From this group, aliphatic amines were found to be effective in increasing the storage life. 2-6, Di-tert-butyl-a-dimethylamino-p-cresol was tested in three different lubricants and improved the storage life of these oils. However, it is possible that this additive would not be effective in oils having different base stocks or additive package and another compound might have to be used. Complete specification tests were run on qualified oils containing 0.1% of 2-6, di-tert-butyl-a-dimethylamino-p-cresol, with the additive having no effect on any of these tests. Four engine tests were run on qualified oils containing 0.1% of the same additive with satisfactory results. Correlation of an accelerated oven test with tropical storage condition is given. From this correlation, the estimated increase in storage life by the use of 2-6, di-tert-butyl-a-dimethylamino-p-cresol is about 2 to 3 years, depending on the initial storage life of the oil. (Author)

Leather and Textiles

Narricot Corp., Philadelphia, Pa.
THE DESIGN AND EVALUATION OF HEAT STABILIZED TAPES AND WEBS, by Jacob Serbin and Herman Becker. Rept. for May 59-May 60 on Air Force Textile Materials, Contract AF 33(600)39447. Oct 60, 80p. WADD Technical rept. 60-252.
Order from OTS $2.00 PB 171 486

The basic purpose of this work was to design and evaluate a series of 13 representative webbings, tapes and ribbons, which would maintain minimum breaking strength and maximum shrinkage when subjected to a temperature of 250°F for a period of five hours. Each of the 13 samples were to be made from Dupont Type 330 or 700 nylon, Chemstrand Type RHB nylon and Dupont Type 51 or 52 Dacron. A heat stabilization process was found necessary to accomplish the desired shrinkage. An experimental pilot program, involving three types of stabilization processes, indicated that a "heat stabilized" continuous method (HSCM) using a dry air oven was the most practical method. Investigation has shown that, with due consideration given to the strength per weight ratio, a woven end item of nylon or Dacron can be stabilized with a measurable degree of success. Additional information was sought to ascertain strength and shrinkage of all items at room temperatures, and also after five hours at 300°F. Dacron items only were tested at 350°F after one hour exposure. All items were checked for seam efficiencies in the natural state and after exposure to 250°F and 300°F for five hours. (Author)

Quartermaster Field Evaluation Agency, Fort Lee, Va.
AN INVESTIGATION OF AN OBJECTIVE METHOD FOR DETERMINING MOISTURE PENETRATION AND ABSORPTION PROPERTIES OF END ITEMS OF LEATHER FOOTWEAR UNDER DYNAMIC FIELD TEST CONDITIONS, by James C. Perkins, Jr. Nov 60, 37p. 7 refs. Technical rept. R-8; FEA MRS 59-7L; AD-247 068.
Order from LC mi$3.00, ph$6.30 PB 153 491

This study was conducted to develop a more refined, objective, and reliable method for determining, on a continuing basis, the instant and location of leak and the amount of moisture penetration and absorption in leather footwear under dynamic or field conditions. The Agency developed and tested an 8-circuit moisture detector and a sensing element for use in conjunction with the multi-circuit detecting instrument. This element incorporates a detection principle involving electrical resistance and resultant changes in resistance activated by water penetration. The detector proved satisfactory and completely met the test objectives.

[Technische Hochschule] Graz (Austria).
THE MICELLAR STRUCTURE OF FIBRES (CELLULOSE AND CERTAIN NYLONTYPE SYNTHETICS), BY MEANS OF X-RAY SCATTERING (1). THE STRUCTURE AND PROPERTIES OF SELECTED MACROMOLECULES (NATURAL AND SYNTHETIC) IN SOLUTION, USING LIGHT-SCATTERING AND OTHER PHYSICAL-CHEMICAL TECHNIQUES (2), by O. Kratky. Final technical rept. for 1 Oct 59-30 Sep 60 on Contract DA 91-591-EUC-1253. [1960] 49p. 16 refs. AD-247 569.
Order from LC mi$3.30, ph$7.80 PB 153 389

A small-angle, X-ray method was developed and improved for use in experiments on the structure of fibers and devices were designed for measuring the absolute intensity. A method is described for eliminating the collimation errors which occur in small-angle, X-ray exposures of solutions. The degree of coiling of cellulose nitrate was investigated. The chain molecules consisted of a large number of persistence lengths which decreased as the degree of coiling increased. Light scattering measurements were made on purified samples of cellulose nitrate in acetone. An experimental source of errors was thought to be microgels, about 10 times as large as the molecules themselves. For studies of their super-molecular structure, thick fibers were prepared isotropic with regard to X-rays in an air swelling (P. H. Hermans and P. Platzek, Z. Physik. Chem. Leipzig, A185:260. 1939) range from about 1.03 to 2.2. Light scattering measurements indicated that the particles separated from each other were of an order of magnitude uniform among themselves, the micelles. Investigations were also started with low-concentration H_2O solutions of the content of the spinning gland of the silkworm at different states of biological development.

Plastics

Naval Supply Research and Development Facility, Bayonne, N. J.
TRANSPARENT PACKAGING, by S. Stambler, C. Katz, and S. Gordon. 3 May 60, 78p. Engineering rept. no. 2.5082; AD-246 081.
Order from OTS $2.00 PB 171 532

This report released for sale to the public 7 Apr 61 as PB 153 198.

This report presents the results of a study to evaluate transparent films for packaging applications. It was determined that no one film could be used as an all purpose military barrier material. Four mil low density polyethylene and laminations of mylar and polyethylene may be used as additional military barrier materials and provide the added property of transparency. Performance requirements based on the needs of the military supply system were developed for transparent films. (Author)

Quartermaster Research and Engineering Center, Natick, Mass.
THE OPTICAL AND MECHANICAL PROPERTIES OF HIGH POLYMERS, by Joseph D. Loconti, Nathaniel S. Schneider, and Harold W. Coles, eds. Rept. on a Series of Lectures by Richard S. Stein, University of Massachusetts. Mar 60, 281p. 69 refs. Research rept High Polymer series no. 14.
Order from LC mi$11.10, ph$42.60 PB 153 628

This report released for sale to the public 15 Mar 61.

Contents:
Statistics of chain configurations
Kinetic theory of rubber elasticity
Birefringence of rubberlike networks
The flow of amorphous networks in the rubbery state
Molecular theories of relaxation time distribution
The glassy state
The crystalline state
Measurement of orientation in crystalline polymers
Mechanical properties of crystalline polymers
Ultimate mechanical properties of polymers

MATHEMATICS

Aarhus U. (Denmark).
A COMBINATORIAL LEMMA FOR COMPLEX NUMBERS, by Glen Baxter (U. of Minnesota). Technical scientific note no. 1 on [Grant] no. AF AFOSR-61-4. 1 Nov 60, 7p. 3 refs. AFOSR-TN-60-1419; AD-248 006.
Order from LC mi$1.80, ph$1.80 PB 153 646

Let S be any permutation of 1 through n. Each fixed permutation S determines a set of points in the complex plane, which in turn determines a convex hull. Properties of the set of convex hulls generated as S ranges over all permutations are investigated. For example, the average number of sides in each of the convex hulls is found to be independent of the complex numbers. The combinatorial results are used to analyze properties of sums of complex-valued, independent and identically distributed random variables. (Author)

Air Force Cambridge Research Labs., Bedford, Mass.
AN ALGORITHM FOR FINDING RATIONAL APPROXIMATIONS, by H. F. Mattson, Jr. Sep 60, 22p. 6 refs. AFCRL-TR-60-196. AD-248 573.
Order from LC mi$2.70, ph$4.80 PB 153 806

Scientific work frequently requires numerical values of functions. Although much general information is often known about these functions, values of them are nevertheless often difficult to compute; although in almost all cases some method for making this computation, however lengthy it may be, is known. The purpose of a rational approximation to a function is to provide a rapid and convenient way to calculate numerical values of the function to within a predetermined error. This paper considers the question of how to find rational approximations to given functions. There appear definitions of terms, a precise statement of what the criterion of best fit is, and statements of some classical results. Two closely related iterative methods for finding best rational approximations are defined. A proof of convergence of these methods is given for a

special case (in which both methods are the same) and these methods are compared with some others. Some results obtained by one of the methods are presented, together with a brief description of the computer program used to obtain them. (Author)

Applied Mathematics and Statistics Labs., Stanford U., Calif.
APPLICATIONS OF SEMI-MARKOV PROCESSES TO COUNTER AND RELIABILITY PROBLEMS, by Richard Barlow. Technical rept. no. 57 on Contract N6onr-251(40). 29 Apr 60, 96p. 35 refs. AD-238 360.
Order from LC mi$5.40, ph$15.30 PB 148 419

A class of counter problems is solved using the technique of the embedded semi-Markov process. A new feature consists of input processes which are non-renewal. In order to solve these problems, some important properties of finite semi-Markov processes are developed. A unified treatment is made of a large class of repairman problems which arise in reliability theory. These problems are identified with appropriate stochastic models from queueing and telephone trunking theory. (Author)

Applied Mathematics and Statistics Labs., Stanford U., Calif.
BILATERAL BIRTH AND DEATH PROCESSES, by William E. Pruitt. Technical rept. no. 22 on Contract Nonr-225(28). 12 May 60, 137p. 12 refs. AD-237 626.
Order from LC mi$6.90, ph$21.30 PB 148 092

Applied Mathematics and Statistics Labs., Stanford U., Calif.
EXPONENTIAL POLYNOMIALS ON COMMUTATIVE SEMIGROUPS, by Jeremy J. Stone. Technical rept. no. 14 on Contract AF 49(638)294. 25 Nov 60, 74p. 11 refs. AFOSR-TN-60-1097; AD-248 780.
Order from LC mi$4.50, ph$12.30 PB 153 860

Applied Mathematics and Statistics Labs., Stanford U., Calif.
A GEOMETRIC PROOF OF THE BIEBERBACH CONJECTURE FOR THE FOURTH COEFFICIENT, by Z. Charzynski and M. Schiffer. Technical rept. no. 86 on Contract Nonr-225(11). 23 Mar 60, 16p. 7 refs. AD-234 732.
Order from LC mi$2.40, ph$3.30 PB 153 689

Let F be the family of all analytic functions which are regular and univalent in the unit circle $|z|<1$ and possess the Taylor development $f(z)=z+a_2z^2+a_3z^3+\ldots+a_nz^n+\ldots$. An alternative proof of Bieberbach's conjecture $|a_n|\leq n$ is presented for the inequality $|a_4|\leq 4$. The proof is modeled after that of Garabedian-Schiffer for the inequality $|a_3|\leq 3$ (Annals of Math. 61:116-136, 1955). Each extremum problem with respect to the coefficients a_k leads to extremum functions $f(z)\in F$ which map the unit circle into a slit domain whose boundary curve satisfies a first order differential equation whose coefficients depend on the a_k. An auxiliary extremum problem in F which can be solved completely due to its particular structure is considered. The inequality $|a_4|\leq 4$ is then derived by combining the new inequality with some known and elementary estimates for the coefficients a_k.

Applied Mathematics and Statistics Labs., Stanford U., Calif.
A NEW PROOF OF THE BIEBERBACH CONJECTURE FOR THE FOURTH COEFFICIENT, by Z. Charzynski and M. Schiffer. Technical rept. no. 85 on Contract Nonr-225(11). 15 Feb 60, 16p. 4 refs. AD-232 835.
Order from LC mi$2.40, ph$3.30 PB 153 139

Elementary methods are shown to be sufficient to establish the proof of the theorem that the fourth coefficient in the Taylor series of a function f(z), univalent in the unit circle, satisfies the inequality $|a_4|\leq 4$. The methods are based on the Grunsky inequality which can be derived elementarily by the use of the Schwarz inequality and the standard methods of contour integration. A new proof is given of the Grunsky inequality based on variational methods.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
ON STURM SEQUENCES FOR TRIDIAGONAL MATRICES, by J. M. Ortega. Technical rept. no. 4 on Contract Nonr-225(37). 15 Feb 60, 9p. 3 refs. AD-232 679.
Order from LC mi$1.80, ph$1.80 PB 153 144

Applied Mathematics and Statistics Labs., Stanford U., Calif.
THEORY AND APPLICATIONS OF THE SEQUENTIAL DESIGN OF EXPERIMENTS, k-ACTIONS AND INFINITELY MANY EXPERIMENTS. PART 1. THEORY, by Stuart A. Bessler. Technical rept. no. 55 on Contract N6onr-25140. 31 Mar 60, 51p. 13 refs. AD-235 276.
Order from LC mi$3.60, ph$9.30 PB 153 688

The theory of sequential design of experiments is a formulation of the experimentation-decision procedure. A k-action problem is discussed in which the space of possible experiments is infinite. The assumption is made that there are 2 actions and that the number of possible state of nature is finite. The sequential problem is shown to exhibit a risk which is asymptotically equal to $-c \log c/I(\Theta)$ as c tends to zero. $I(\Theta)$ is a measure of information. The procedure remains asymptotically optimal in the sense that, for any procedure to do significantly better than the sequential procedure for some value of the parameter, it must do worse by an order of magnitude for some other values of Θ. Several examples are considered: problems which involve the identification of several known but untagged populations, procedures for checking the reliability of a 2 component system, and problem of determining which of 3 populations has the greatest mean. A means of measuring the efficiency of an arbitrary procedure is presented, and, in each example, the efficiencies of a common alternative procedure is completed.

Brown U. Div. of Applied Mathematics, Providence, R. I.
AN ESTIMATE OF THE SPECTRUM OF A STATIONARY TIME SERIES, by R. H. Jones. Technical rept. no. 3 on Contract DA 36-039-sc-78130. Feb 59, 11p. 1 ref. Rept. DA-SC-78130/3; AD-211 414.
Order from LC mi$2.40, ph$3.30 PB 153 600

Spectral analysis of a stationary time series is considered for the case of discrete spectral windows. A method for determining optimal estimates of the spectral density is studied by using the concept of bandwidth. (Author)

Chicago U. [Ill.]
DECOMPOSABILITY OF MODULES, by Irving Kaplansky. Technical rept. no. 2 on Investigations in Algebras and Finite Fields, Contract DA 11-022-ORD-2492. Oct 60, 8p. 5 refs. OOR rept. 1833:2-M; AD-246 299.
Order from LC mi$1.80, ph$1.80 PB 153 664

The following theorem is proved: For any Noetherian integral domain R, the following two statements are equivalent: (1) R is local, complete, and of Krull dimension less than or equal to 1, and (2) Any torsion-free R-module of rank two which is not finitely generated is a direct sum of modules of rank one. (Author)

Columbia U., New York.
RECURRENT GAMES AND THE PETERSBURG PARADOX, by Herbert Robbins. Rept. on Contract Nonr-266(59). [1960] 13p. 2 refs. UC-18-60-Nonr-266(59) MS; AD-236 738.
Order from LC mi$2.40, ph$3.30 PB 147 547

Columbia U. School of Engineering, New York.
MULTIVARIATE ASYMPTOTIC DISTRIBUTIONS OF EXTREME VALUES, by E. J. Gumbel and Simeon M. Berman. Technical rept. T-19A on Contract DA 30-069-ORD-1061. [1960] 26p. 6 refs. CU 14 58 ORD 1061 IE; OOR rept. 1716.13-E; AD-240 734.
Order from LC mi$2.70, ph$4.80 PB 153 665

Examples of multivariate asymptotic distributions of largest and smallest values are presented. Explicit analytical expressions for some distributions in the class are given. The elements of bivariate distribution theory are reviewed, and a system of bivariate distributions with arbitrary margins is constructed. This construction is used to form bivariate distributions which are joint asymptotic distributions of the largest and smallest values, respectively. Some generalizations follow. The largest and the smallest values of a bivariate logistic distribution are analyzed and are shown to behave in entirely different ways, due to the asymmetry of the distribution. Another bivariate asymptotic distribution of extremes is found from the smallest values of the bivariate logistic distribution. (Author)

David Taylor Model Basin, Washington, D. C.
LECTURES ON TOPICS IN NONLINEAR DIFFERENTIAL EQUATIONS, by G. Temple (Oxford U.) Mar 60, 49p. 8 refs. Rept. 1415.
Order from LC mi$3.30, ph$7.80 PB 154 768

This report released for sale to the public 15 Mar 61.

These lectures describe some recent researches on ordinary nonlinear differential equations. The first lecture is devoted to a search for a "superposition" principle for these nonlinear equations and it determines the class of nonlinear equations for which such a superposition principle exists. The remaining four lectures provide a rigorous, analytical theory of the technique invented by Lighthill (1949) for solving nonlinear differential equations with an "irregular" perturbation. Such equations involve a small parameter α and such that the coefficient of the highest derivative vanished identically, or at the "initial point", when $\alpha = 0$. The theory is developed from a number of simple examples and given a rigorous form by means of the theory of "dominant functions". (Author)

Digital Computer Lab., U. of Illinois, Urbana.
ROUNDOFF-ERROR ACCUMULATION IN ITERATIVE PROCEDURES, by Robert T. Gregory and A. H. Taub. Rept. on National Science Foundation Grant G-9503. 31 Oct 60, 12p. Rept. no. 103; AD-247 367.
Order from LC mi$2.40, ph$3.30 PB 153 415

Educational Testing Service, Princeton, N. J.
AN IBM 650 PROGRAM FOR A COMPLETE PAIRED COMPARISONS SCHEDULE (PARCOPLET-2-21) by Harold Gulliksen. Rept. on Mathematical Techniques in Psychology, Contract Nonr-1858(15) and National Science Foundation Grant G-642. May 60, 4p. 2 refs. AD-237 504.
Order from LC mi$1.80, ph$1.80 PB 147 363

In order to facilitate analysis of paired comparison data, an IBM 650 program was prepared that will handle a complete paired comparison schedule for any number of objects up to and including 21. It is also possible to append and analyze an absolute judgment set of data in which the subject classifies the stimuli into two categories as positive or negative, like or dislike. A checking program was also prepared to insure that the data cards are in proper form. (Author)

Electronics Research Lab., U. of California, Berkeley.
ON THE SUMMATION OF $\sum_{n=0}^{\infty} \frac{f_n}{n^k}$ AND ITS ASSOCIATED INTEGRALS, by E. I. Jury and M. A. Pai. Rept. on Contract AF 18(600)1521. 14 Sep 60, 25p. 12 refs. Series no. 60, issue no. 315; AFOSR-TN-60-1145; AD-246 763.
Order from LC mi$2.70, ph$4.80 PB 153 313

A geometrical interpretation of the convolution z transform is given and this is applied to develop z transforms of functions of the type $f(t)/t^k$, $k > 0$. After establishing the equivalence between certain forms of integrals, the authors have used the integrals to sum certain forms of infinite series. Possible extensions of this technique to other forms of series and to sum finite series is also indicated. (Author)

Harvard U. [Cambridge, Mass.]
ON THE DEGREE OF CONVERGENCE OF SEQUENCES OF EXTREMAL POLYNOMIALS AND OTHER EXTREMAL FUNCTIONS, by J. L. Walsh and A. Sinclair. Rept. on Contracts AF 49(638)574,

AF 18(600)1461, and N5ori-076(34). Mar 60, 48p. 25 refs. AFOSR TN-60-223; AD-244 390.
Order from LC mi$3.30, ph$7.80 PB 152 370

Let a given function F(z) be of class L^p, $p > 1$, on an analytic Jordan curve γ in the plane of the complex variable z, and let $p_n(z)$ be the unique sequence of polynomials in z of respective degrees n of best approximation to F(z) on γ in the sense of minimizing

$$\int_{\gamma} |F(z) - p_n(z)|^p |dz|.$$

These minimizing $p_n(z)$ may also be subjected to certain auxiliary conditions of interpolation $p_n(w_k) = u_k$, $k = 1, 2, \ldots, m$, which are independent of n and are not necessarily related to F(z). Convergence and degree of convergence of the sequence $p_n(z)$ to a possible limit minimizing function, and various properties of this limit function are studied. (Author)

Illinois Inst. of Tech., Chicago, Ill.
A GRAPHICAL METHOD FOR THE DOUBLE-SPECIFICATION LIMIT ACCEPTANCE SAMPLING PROCEDURES OF MIL-STD 414, by George J. Resnikoff and Leroy A. Wickstrom. Technical rept. no. 1 on Contract Nonr-1406(05). 19 Feb 60, 44p; AD-236 065.
Order from LC mi$3.30, ph$7.80 PB 153 146

[Illinois U., Urbana].
SOME THEOREMS ON THE GROWTH OF PARTITION FUNCTIONS, by Subramonier Parameswaran. Thesis. Technical.rept. on Contract Nonr-1834(18). [1959] 47p. 14 refs. AD-232 644.
Order from LC mi$3.30, ph$7.80 PB 153 135

An asymptotic relation of the form $n(u) \sim u^{\alpha} L(u)$ as $u \to +\infty$ is considered for $\alpha = 0$, where L(u) is a slowly oscillating function.

Institute for Advanced Study, Princeton, N. J.
RESEARCH IN ANALYSIS AND ALGEBRA, by Andrew Gleason and S. Łojasiewicz. Final rept. on Contract DA 36-034-ORD-2884 RD. July 60, 3p. OOR rept. 2422.5-M.
Order from LC mi$1.80, ph$1.80 PB 153 678

Brief report on function algebras and sheaves of sets over a manifold.

Institute of Statistics, North Carolina U., Chapel Hill.
BAYES RULES FOR A COMMON MULTIPLE COMPARISONS PROBLEM AND RELATED STUDENT-t PROBLEMS, by David B. Duncan. Rept. on Contracts AF 49(638)929, AF 49(638)261 and Nonr-355(06). Nov 60, 36p. 18 refs. Mimeograph series no. 268; AFOSR-TN-60-1418, Revision and extension of AFOSR-TN-59-492; AD-248 659.
Order from LC mi$3.00, ph$6.30 PB 153 840

The paper is mainly concerned with the multiple comparisons problem in the analysis of variance setting. A principal finding is that the Bayes solution for the multiple comparisons problem corresponds to a tolerated error probability " of the first kind" for each single difference, which is independent of the number of treatments being compared.

Institute of Statistics, U. of North Carolina, Chapel Hill.
ON A NEW DERIVATION OF A WELL KNOWN DISTRIBUTION, by S. N. Roy. Rept. on Contract AF 49(638)213. Apr 60, 11p. 5 refs. Mimeograph series no. 254; AFOSR-TN-60-985.
Order from LC mi$2.40, ph$3.30 PB 153 832

It is well known that so far the joint distribution of the latent roots associated with normal multivariate analysis of variance has been considerably more difficult to derive if the effective number of variates is greater than the number of components of the linear hypothesis than if it is the other way around. This report offers both on the null and the non null hypothesis a simple method of derivation of the distribution for the former case by throwing it back on the distribution for the latter case, and in this tie-up a pivotal role is played by the distribution of the latent roots connected with the testing of the hypothesis of independence between two sets of variates. (Author)

Institute of Statistics, U. of North Carolina, Chapel Hill.
ON CERTAIN ALTERNATIVE HYPOTHESES ON DISPERSION MATRICES, by S. N. Roy and R. Gnanadesikan (Bell Telephone Labs.) Rept. on Contract AF 49(638)213. Aug 60, 19p. 10 refs. Mimeograph series no. 261; AFOSR-TN-60-984; AD-248 657.
Order from LC mi$2.40, ph$3.30 PB 153 831

For two multivariate nonsingular normal distributions, the familiar null hypothesis of equal dispersion matrices is considered against various alternatives stated in terms of certain characteristic roots. Based on two independent random samples from the two distributions, similar region tests are proposed for the null hypothesis against each of the alternative hypotheses. Also, for each case, conservative confidence bounds are obtained on one or more parametric functions which measure departure from the null hypothesis in the direction of the corresponding alternative. Finally, a physical interpretation is given for the alternative hypotheses considered. (Author)

Institute of Statistics, U. of North Carolina, Chapel Hill.
ON SEQUENCES OF SUMS OF INDEPENDENT RANDOM VECTORS, by Wassily Hoeffding. Rept. on Contract AF 49(638)261. May 60, 25p. 7 refs. Mimeograph series no. 258; AFOSR-TN-60-987.
Order from LC mi$2.70, ph$4.80 PB 153 833

A particle in k-space starts at $S_0 = 0$ and after n time units is at S_n, where S_n is the sum of n independent, identically distributed random vectors with integer-valued components, zero means, and non-singular second-moment matrix. A time-dependent absorption boundary is present such that the expected time to absorption is finite. A relation is established between the expected number of times the particle is at the origin prior to absorption and its expected distance from the origin at the time of absorption. (Author)

Institute of Statistics, U. of North Carolina, Chapel Hill.
ON SOME METHODS OF CONSTRUCTION OF PARTIALLY BALANCED ARRAYS, by I. M. Chakravarti. Rept. on Contract AF 49(638)213. May 60, 10p. 7 refs. Mimeograph series no. 260; AFOSR-TN-60-1019.
Order from LC mi$1.80, ph$1.80 PB 153 834

Methods of construction of partially balanced arrays are considered in this report. Two methods of construction are given. One of them derives partially balanced arrays from (λ - μ - ν) configurations and the other is an extension of Bose-Shrikhande method of construction of orthogonal arrays. (Author)

Institute of Tech., U. of Minnesota, Minneapolis.
BIFURCATION OF AN INVARIANT MANIFOLD FROM A PERIODIC SOLUTION OF A DIFFERENTIAL SYSTEM, by Fred S. Van Vleck. Technical rept. for 16 June-15 Aug 60 on Problems in the Theory of Ordinary Differential and Difference Equations, Contract DA 11-022-ORD-3369. July 60, 98p. 20 refs. OOR rept. 2560.2-M; AD-243 170.
Order from LC mi$5.40, ph$15.30 PB 153 680

Consider the real autonomous system $dx/dt = f(x, \mu)$, where μ is a real parameter and x, f are (n+1)-vectors. The assumption is made that f has second partial derivatives with respect to x which are continuous in (x, μ). Assume that the system has a periodic solution $x = \phi(t)$ for all μ and that the characteristic exponents of the autonomous system, based on ϕ, have zero real parts for $\mu = 0$. No restrictions are placed on the imaginary parts. Under certain restrictions, an n-manifold in the x-space bifurcates (branches off) from the fixed periodic solution for values of μ near zero. This manifold is homeomorphic to the product of the (n-1) -sphere and the 1-sphere and contains the periodic solution in its interior. (Author)

Iowa State U. of Science and Tech., Ames.
SOME ALMOST PERIODIC SOLUTIONS OF THE VAN DER POL EQUATION WITH ALMOST PERIODIC FORCING, by D. D. James and C. E. Langenhop. Technical rept. no. 2, 1 July-31 Aug 60, on Almost Periodic Solutions of Differential Equations, Contract DA 11-022-ORD-2630. [1960] 17p. 4 refs. OOR rept. 1857.4-M; AD-242 576.
Order from LC mi$2.40, ph$3.30 PB 153 668

The differential equation
$$\ddot{x} + \epsilon(x^2 - 1)\dot{x} + (\alpha^2 - \epsilon\gamma)x = \epsilon\beta \sin at + kb(\omega t),$$
where $\alpha, \beta, \epsilon, \omega$ and k are positive parameters and b(t) is almost periodic, is treated. The use of a perturbation procedure provides results regarding the existence and stability of certain almost periodic solutions of the differential equation for ϵ sufficiently small and k or $\frac{k}{1+\omega}$ sufficiently small. The existence and nature of these almost periodic solutions is determined by relations among the three parameters α, β, γ. (Author)

Liege U. (Belgium).
PROBLEMS AND METHODS IN PARTIAL DIFFERENTIAL EQUATIONS. PART II: THE METHOD OF SINGULARITIES, by F. J. Bureau. Technical (scientific) note no. 4 on Contract AF 61(052)86. July 60, 89p. 17 refs. AFOSR-TN-60-890. AD-246 981
Order from LC mi$4.80, ph$13.80 PB 153 307

The method of singularities is used to solve the Cauchy problem for simple hyperbolic partial differential equations, namely, the wave equation and the damped wave equation. The representation formula for the solution of the Cauchy problem is written in terms of finite parts and logarithmic parts of certain divergent integrals. A process of analytic continuation is also used to solve the Cauchy problems under consideration. However, to obtain explicitly the representation formulas for the solutions, one must actually perform the analytic continuation. It is shown that this is best achieved by making use of finite and logarithmic parts. Simple examples were purposely chosen so as to show that consideration of finite and logarithmic parts is naturally unavoidable. (Author)

Lincoln Lab., Mass. Inst. of Tech., Lexington.
CODING INSTRUCTIONS FOR FLOATING POINT TRIGONOMETRIC, INVERSE TRIGONOMETRIC HYPERBOLIC AND EXPONENTIAL FUNCTIONS, by B. A. Jensen. Rept. on Contract AF 19(604)7400. 1 Nov 60, 8p. 30G-0009; AD-246 189.
Order from LC mi$1.80, ph$1.80 PB 153 052

The addition of the trigonometric, inverse trigonometric, exponential and hyperbolic functions to the floating point program of the CG 24 computer provides the programmer with a method of doing many computations that formerly required desk calculators. The rules for writing the instructions are simple, programming time is reduced, numbers are written in the ordinary decimal form $\pm 23.9 \times 10^{3}$, seven significant decimal figures are kept during the computation, and the answers can be printed out at the machine in decimal form. Any computation involving addition, subtraction, multiplication, division, square root, sin, cos, tan, cot, sec, csc, $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$, $\cot^{-1}$, $\sec^{-1}$, $\csc^{-1}$, e^{x}, e^{-x}, sinh, cosh, tanh, coth, sech, csch and requiring an accuracy of seven significant decimal figures can thus be carried out on the CG 24 computer. (Author)

Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN EMPIRICAL INVESTIGATION OF PROCEDURES FOR LOCATING THE MAXIMUM PEAK OF A MULTIPLE-PEAK REGRESSION FUNCTION, by E. J. Magee. Rept. on Contract AF 19(604)7400. 20 Oct 60, 32p. 4 refs. 22G-0046; AD-245 672.
Order from LC mi$3.00, ph$6.30 PB 152 956

This study is concerned with the development of an efficient procedure for locating the (absolute) maximum of an unknown regression function which may have a number of local maxima. Procedures combining stochastic approximation and random search techniques are described and experimental results are presented. Experimentation with procedures of

this type indicates that the approach is an effective one. It is evident that stochastic approximation alone is not sufficient but must be combined with a search mechanism to avoid converging to a local maximum. The most efficient of three versions tested is one in which two self-adjusting Kiefer-Wolfowitz stochastic approximation processes are in operation concurrently and time is distributed randomly between the processes. There appears to be no advantage in having more than two processes in operation concurrently, particularly when it is desired to remember only the maximum peak. (Author)

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON THE BEHAVIOUR OF THE GEOMETRIC GENUS UNDER GROUND FIELD EXTENSION, by Peter Falb. Rept. on Contract AF 19(604)7400. 20 Oct 60, 10p. 2 refs. 22G-0051; AD-245 548.
Order from LC mi$1.80, ph$1.80 PB 152 828

The behavior of the geometric genus, $p_g(K/k)$, of a function field, K/k, in two variables under constant field extension is discussed. If K' is obtained from K by the constant field extension k-to k', then $p_g(K/k) \geq p_g(K'/k')$, with equality if k'/k is purely transcendental or separable algebraic. (Author)

Massachusetts Inst. of Tech., Cambridge.
GENERALIZED HOMOLOGY THEORIES, by George W. Whitehead. Interim technical rept. no. 3 on Group Complexes and Cohomology Operations, Contract DA 19-020-ORD-4851. [1960] 86p. 43 refs. OOR rept. 2246:4-M; AD-246 688.
Order from LC mi$4.80, ph$13.80 PB 153 676

Proof is presented that the generalized homology groups satisfy the Eilenberg-Steenrod axioms, except for the dimension axiom. Homology and homotopy properties of the reduced join are discussed as are properties of spectra. In addition proof is given for an Alexander duality theorem. (Author)

Massachusetts Inst. of Tech., Cambridge.
ON STABLE HOMOTOPY THEORY, by Daniel M. Kan. Interim technical rept. no. 2 on Group Complexes and Chomology Operations, Contract DA 19-020-ORD-4851. [1960] 56p. 21 refs. OOR rept. 2246.2-M; AD-242 660.
Order from LC mi$3.60, ph$9.30 PB 153 675

The notion of spectra is defined in the semisimplicial context. A simple definition which has (unlike the topological definition) all the maps built in is possible, and a homotopy theory of these spectra can be developed which parallels the usual homotopy theory of semisimplicial complexes. A discussion is presented of the homotopy groups and homology groups of spectra (which are also defined in negative degrees) and a kind of Hurewicz homomorphisms connecting them. A spectral sequence is obtained which relates, for any semisimplicial complex, the integral homology with the stable homotopy groups.

Michigan State U. [East Lansing].
MULTIVARIATE ANALYSIS, by Ingram Olkin. Final technical rept. for 1955-1960 on Contracts DA 11-022-ORD-1998 and DA 20-018-ORD-14735. 10 June 60, 17p. 19 refs. OOR rept. 1840.18-M; AD-243 172.
Order from LC mi$2.40, ph$3.30 PB 153 669

Technical reports on the research in multivariate analysis, as well as the status of publication are listed. A general survey of the project and the results achieved is reviewed. (Author) (See also AD-243 171)

Michigan U. Coll. of Literature, Science and the Arts, Ann Arbor.
ASYMMETRIC PRIME ENDS, by E. F. Collingwood and G. Piranian. Technical note on Contract AF 49(638)633, Oct 60, 11p. 6 refs. 2913-3-T; AFOSR-TN-60-992; AD-246 373.
Order from LC mi$2.40, ph$3.30 PB 153 200

Each simply connected domain in the plane has at most countably many prime ends whose right and left wings do not coincide. On the other hand, to each countable set E on the unit circle C there corresponds a function which is holomorphic and univalent in the unit disk D and which has the property that it carries each point of E and no point of C E onto a prime end with unequal wings. (Author)

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
A CONVERSE OF A THEOREM OF R. H. BING AND ITS GENERALIZATION, by R. L. Wilder. Technical note on Contract AF 49(638)774. Sep 60, 9p. 4 refs. 03597-2-T; AFOSR-TN-60-1071; AD-246 627.
Order from LC mi$1.80, ph$1.80 PB 153 267

R. H. Bing (Am. Math. Soc. 838, 1959) announced that in 3-space every topological 2-sphere S is "almost free" in that for every positive number e there exists a Cantor set C in S and an e-transformation of S into a set which meets S only in C; and it seems highly probable that the general 2-manifold will have the same property. A converse of this is shown and a new positional characterization of the manifold is obtained. An analogous sufficient condition is also provided for the general n-dimensional Euclidean space. (Author)

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
EXTENSION OF LOCAL AND MEDIAL PROPERTIES TO COMPACTIFICATIONS WITH AN APPLICATION TO ČECH MANIFOLDS, by R. L. Wilder. Technical note on Contracts AF 49(638)104 and AF 49(638)774. Sep 60, 22p. 11 refs. 03000, 03597-1-T; AFOSR-TN-60-1062; AD-246 626.
Order from LC mi$2.70, ph$4.80 PB 153 266

Of central importance in topology and its applications have been the manifolds of various dimensions. In 1936, in a paper published in the Proceedings of the National Academy of Sciences, Eduard Čech proposed for study a type of manifold which embodied a condition theretofore not used, to wit, that every point

have a neighborhood whose one-point compactification is an orientable closed manifold. In the present paper, the chief question studied relates to the implication of this condition if applied to arbitrarily small neighborhoods of a point. This necessitates a search for conditions under which a locally compact space, which has a given type of local connectedness, will preserve this under compactifications. Necessary and sufficient conditions are obtained which apply to both the one-point and to the Freudenthal compactifications. In particular, it is found that if a manifold satisfies the Čech condition for arbitrarily small neighborhoods of a point x, then x has arbitrarily small neighborhoods that are r-acyclic (in terms of compact homology) in all dimensions r. The question which then obviously arises, whether all manifolds of the type in current use have such neighborhoods, is answered by providing an example of one which does not. (Author)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ON THE FACTORIZATION OF RATIONAL MATRICES, by D. C. Youla. Rept. on Contract AF 19(604)4143. 20 Sep 60, 44p. 11 refs. Research rept. PIBMRI 855-60; AFCRL-TN-60-1112.
Order from LC mi$3.30, ph$7.80 PB 153 554

A systematic account is given of some of the more recent developments in the algebra of rational matrix functions of a single complex variable. Several algorithms for the factorization of such matrices are presented and illustrated with two non-trivial examples. The theory is applied to three problems of engineering importance, one of them being the solution of matrix Wiener-Hopf integral equations. (Author)

Minnesota U., Minneapolis.
THE CIRCUMFERENCE OF A CONVEX POLYGON, by Frank Spitzer and Harold Widon. Technical rept. no. 2 on Contract Nonr-710(28) [1960] 7p. 2 refs. AD-233 291.
Order from LC mi$1.80, ph$1.80 PB 153 771

A convexity theorem of Cauchy (Cambridge Univ. Press, 1958) is combined with the combinatorial identity of M. Kac (Duke Math. J. 21;501-509, 1954). Cauchy's theorem concerns the length L of the circumference of a compact convex set A in the plane. Kac considered a vector $\vec{x}=(x_1, x_2, \ldots, x_n)$ with real components. A vector $\vec{z}=(z_1, z_2, \ldots, z_n)$ with complex components is now considered.

Minnesota U., Minneapolis.
SOME PROPERTIES OF RECURRENT RANDOM WALK, by Frank Spitzer. Technical rept. no. 4 on Contract Nonr-710(28). [1959] 28p. 5 refs. AD-236 405.
Order from LC mi$2.70, ph$4.80 PB 147 176

Consider the stochastic process $S = S_j + \sum X_i$, $j = 0$ and $i = 1, 2, \ldots, n$. S_j is an arbitrary integer, and the X_i are independent, identically distributed, integer valued random variables. The assumption is made that the state space of the process is the set of all integers, and that every point is visited infinitely often with probability one, for every starting point S_j. S is an indecomposable recurrent Markov chain on the set of all integers. Let x and y be two distinct integers, $|x-y| = k > 0$. Consider the embedded Markov chain induced by the set $S = \{x, y\}$ of these two points. The Markov chain whose transition matrix is $P(S) = (P_{ij}(S))$; $i, j = 1, 2$; is discussed. Fourier analytical estimates, based on a technique of Chung and Erdos (Memoirs Am. Math. Soc. 6, 1951), are used. The proof requires an extension of the investigation to the embedded Markov chain induced by a set of three instead of two states. These extended results are summarized.

Minnesota U., Minneapolis.
THE TOEPLITZ MATRICES OF AN ARBITRARY LAURENT POLYNOMIAL, by Palle Schmidt and Frank Spitzer. Technical rept. no. 3 on Contract Nonr-710(28). 24 Feb 60, 37p. 9 refs. AD-233 292.
Order form LC mi$3.00, ph$6.30 PB 153 133

North Carolina State Coll., Raleigh.
GENERAL PERTURBATIONAL SOLUTIONS OF THE MATHIEU EQUATION, by Raymond A. Struble and John E. Fletcher. Technical memo. no. 5 on Contract DA 36-034-ORD-2733. Sep 60, 20p. 1 ref. OOR rept. 2125:12-M; AD-244 087.
Order from LC mi$2.40, ph$3.30 PB 153 672

General perturbational solutions of the Mathieu equation are obtained in the form of asymptotic series. The principal part of a solution is obtained by a modified variation of parameter technique which admits only slow (long period) variations in the amplitude and phase. All rapid (short period) perturbations are obtained as additive corrections to the principal part. The explicit solutions are either almost-periodic functions or diverging or decaying oscillations. The resonance phenomena associated with critical values of the equation parameters are manifest in the variational equations and the familiar periodic solutions (Mathieu functions) emerge merely as singular solutions of these variational equations. Also both divergent and decaying oscillations emerge near the critical parameter values, thus revealing the well-known stability properties of the Mathieu equation. (Author)

Northwestern Technological Inst., Evanston, Ill.
SOME NOTES ON NON-HOMOGENEOUS CONVEX POLYHEDRAL CONES, by A. Ben-Israel. ONR Research memo. no. 30 on Temporal Planning and Management Decision under Risk and Uncertainty, Contract Nonr-1228(10). May 60, 9p. 6 refs. AD-237 864.
Order from LC mi$1.80, ph$1.80 PB 148 200

Nuclear Development Corp. of America, White Plains, N. Y.
A PROGRAM FOR THE NUMERICAL INTEGRATION OF THE BOLTZMANN TRANSPORT EQUATION, NIOBE, by S. Preiser, G. Rabinowitz, and E. deDufour. Rept. on Study for a Code Embodying the Numerical Integration of the Boltzmann Equation, Contract AF 33(616)6184. Dec 60, 67p. 9 refs. ARL

Technical rept. 60-314.
Order from LC mi$3.90, ph$10.80 PB 152 587

A code (NIOBE) for numerically integrating the time-independent neutron or gamma ray Boltzmann transport equation has been written for the IBM-704. The code will calculate angular distributions, total fluxes and currents for neutrons (or photons) as a function of energy (or wave length) in a finite, multilayered, spherically symmetric configuration. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
HIGH ORDER CORRECT DIFFERENCE SCHEMES FOR ANISOTROPIC PARABOLIC EQUATIONS, by Richard Herman and J. R. M. Radok. Rept. on Contract AF 49(638)302. Oct 60. 10p. 2 refs. PIBAL rept. no. 581; AFOSR-TN-60-1304; AD-246 922.
Order from LC mi$1.80, ph$1.80 PB 153 296

Difference schemes for anisotropic parabolic equations are deduced for given order of truncation errors and their relationship to similar schemes for the one dimensional heat equation is demonstrated.

RIAS, Baltimore, Md.
ALGORITHMS FOR JORDAN CURVES ON COMPACT SURFACES, by Bruce L. Reinhart. Rept. on Contract AF 49(638)382. Nov 60, 28p. 17 refs. Technical rept. 60-21; AFOSR-TN-60-1123; AD-248 305.
Order from LC mi$2.70, ph$4.80 PB 153 710

The purpose is to give an algorithm for determining which free homotopy classes admit a simple closed (Jordan) curve in the case of compact surfaces of negative Euler number.

RIAS, Baltimore, Md.
CLOSED METRIC FOLIATIONS, by B. L. Reinhart. Rept. on Contract AF 49(638)382. Sep 60, 11p. 6 refs. Technical rept. 60-17; AFOSR-TN-60-1039; AD-247 232.
Order from LC mi$2.40, ph$3.30 PB 153 413

M is a C^{∞}n dimensional manifold with a p dimensional foliation F and a fibre-like Riemannian ds. This report is concerned solely with the case that all leaves are closed subsets of M.

Virginia Agricultural Experiment Station, Blacksburg
AN INVENTORY CONTROL PROBLEM WITH REGULAR AND EMERGENCY DEMANDS, by Roshan L. Chaddha. Technical rept. no. 11 on Development of Statistical Methods for Experimental Designs in Quality Control and Surveillance Testing, Contract Nonr-2352(01). Mar 60, 204p. 33 refs. AD-236 467.
Order from LC mi$9.30, ph$31.80 PB 153 782

Optimum split of a stock of a single item is discussed under the assumption that the decision to replenish the inventory is taken at equally space time intervals. The lag time between ordering and receiving an order for replenishment is assumed to be zero. The demand distribution is assumed to be independently and identically distributed in successive time intervals. Four different replenishment policies are considered with respect to both their general operating characteristics and their effect on the point of optimum split. The stationary distribution of the inventory content variable is found under the various replenishment policies; these probabilities are used to obtain the point of optimum split. Comparison between the policies, under assumptions of geometric demand distribution (discrete), or negative exponential demand distribution (continuous), is made. Tables for making these comparisons are also presented. (Author)

Washington U., Seattle.
THE EFFECT OF LIMITING THE NUMBER OF ITERATIONS ON A PRINCIPAL AXES FACTOR ANALYSIS SOLUTION, by Harold William Burk. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(04). Feb 60, 58p. 18 refs; AD-233 218.
Order from LC mi$3.60, ph$9.30 PB 153 132

Using a mathematical rationale developed by Horst (Servant of the Human Sciences, U. of Wash., 1953), data from several sources, and a program written by Lunneborg and Wright which allows limiting the number of iterations completed, arbitrary factor loading matrices were found for several matrices using different iteration limits. From the results, it appears that limiting iterations can be a useful procedure. It would reduce considerably the cost of factor analyses, particularly in cases where some of the latent roots of a matrix were close together in value. The cycle limits would not affect the determination of the rank of a matrix. The shortened procedure will account for about as much of the variance in the matrix as the unlimited procedure if cycle limits are not set too low. If precise principal axes data is desired or primary interest is in interfactor correlations, this shortened procedure has less value. The values of elements in corresponding residual matrices will not be identical with those obtained with the unlimited procedure. Limiting cycles will tend to increase inter-factor correlations. When factoring is continued until some specified value is reached, the procedure may result in the isolation of an additional factor when low limits are used. The removal of a given number of factors with limited iterations generally accounted for more variance than did the unlimitel calculation with one less factor. Hence the ultimate usefulness of the shortened procedure will depend on the nature of the original data and the purposes of the experimenter. (Author)

[Wayne State U., Detroit, Mich.]
FIBERINGS OF ENVELOPING SPACES, by Sze-Tsen Hu. Technical note no. 10 on Contract AF 49(638)179. Oct 60, 36p. 7 refs. AFOSR-TN-60-1224; AD-246 491.
Order from LC mi$3.00, ph$6.30 PB 153 177

Since the enveloping spaces and the residual spaces were shown to be very useful in distinguishing spaces of the same homotopy type, the homology groups and the homotopy groups of the enveloping spaces of a manifold are computed. For this purpose, the fact is established that the natural projection is a fibering. The method of fiber spaces can be applied and most of the groups computed. (Author)

Yale U. [New Haven, Conn.]
SELECTED TOPICS IN FUNCTIONAL ANALYSIS, by Einar Hille, Alexandra and Cassius Ionescu Tulcea. Final technical rept. for 1 Sep 58-31 Aug 60 on Contracts DA 19-059-ORD-2707 and DA 19-020-ORD-4912. [1960] 17p. 11 refs. OOR rept. 2070:1-M; AD-247 239.
Order from LC mi$2.40, ph$3.30 PB 153 671

Computing Devices

Bendix Aviation Corp., Detroit, Mich.
THREE DIMENSIONAL FLIGHT TABLE DEVICE NO. 24-X-5, by M. Kanes. Final rept. on Contract Nonr-321(01). [1955] 9p. Rept. no. 775; AD-82 734.
Order from LC mi$1.80, ph$1.80 PB 154 806

This report released for sale to the public 17 Mar 61.

The simulator was developed for use with a master computer for the purpose of simulating the flight of fast air-to-air missiles on a 1-to-1 time scale. The unit consists of a high-performance, servo-controlled gimbal system which follows command inputs from an analog computer. Missile sections and components mounted on these gimbals are subjected to the torques, angular accelerations, and angular velocities which would be experienced in the flight being simulated. Instruments on the gimbals system monitor velocity and position, and compute Euler angle transformations.

California U., Los Angeles.
ELECTRONIC DATA PROCESSING MACHINE REQUIREMENTS, by Richard G. Canning. Rept. on Management Sciences Research Proj. [Contract Nonr-233(02)] 31 July 53, 31p. 11 refs. Research rept. no. 16; AD-143 050.
Order from LC mi$3.00, ph$6.30 PB 154 422

This report released for sale to the public 8 Mar 61.

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DETERMINATION OF R_{cutoff} FOR ASYMMETRIC CHANNEL, by B. Reiffen. Rept. on Contract AF 19(604)7400. 24 Oct 60, 18p. 25G-0021; AD-246 372.
Order from LC mi$2.40, ph$3.30 PB 153 108

Previously the author defined a computation cutoff rate, R_{cutoff}, for a discrete memoryless channel symmetric at its output with equally likely inputs. For information rates $R < R_{cutoff}$, sequential decoding may proceed with an average number of decoding computation which does not grow exponentially with constraint length n. In this report, R_{cutoff} is defined for the general non-degenerate discrete memoryless channel with arbitrary input probabilities. (Author)

Lincoln Lab., Mass. Inst. of Tech., Lexington.
GRAPHICAL MANIPULATION TECHNIQUES USING THE LINCOLN TX-2 COMPUTER, by Herschel H. Loomis, Jr. Rept. on Contract AF 19(604)7400. 10 Nov 60, 28p. 3 refs. 51G-0017.
Order from LC mi$2.70, ph$4.80 PB 153 485

The results of an investigation into the use of a computer controlled oscilloscope display for graphical manipulation, including symbol drawing and positioning of symbols to form a drawing, are reported. The structure and operation of a program to draw symbols and to use these symbols for the construction of a drawing are discussed. Finally, the type of program which would aid the logical designer in his logical circuit design by preparing and filing the drawings and analyzing the circuits for such items as signal delays and unit loading factors is discussed in brief. (Author)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
GENERAL SWITCHING THEORY, by S. Litwin, R. McNaughton, and R. L. Wexelblat. Rept. for July 58-Sep 60 on Contract AF 33(616)5886. 15 Sep 60, 67p. 30 refs. WADD Technical rept. 60-678.
Order from OTS $1.75 PB 171 555

After summarizing the entire effort, detailed reviews of the GO program and the work on languages of symbolic logic are given. The RENJYU program is described in detail and a natural-language learning model is described. (Author)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
SYMBOLIC LOGIC AND AUTOMATA, by Robert McNaughton. Technical note no. 3 on General Switching Theory, Contract AF 33(616)5886. July 60, 36p. 10 refs. Rept. no. 60-25; WADD Technical note 60-244.
Order from OTS $1.00 PB 171 548

This paper presents certain languages of symbolic logic for the description of the behavior of finite automata. It describes precisely the conditions under which a formula of these languages describes the behavior of an automaton, and presents a synthesis algorithm which constructs a state graph for an automaton given a formula that describes the automaton. It closes by listing some unsolved problems about these languages. (Author)

Naval Ordnance Lab., Corona, Calif.
THIN FILM MAGNETIZATION REVERSAL STUDIES, by Robert L. Conger. Sep 58, 18p. 5 refs. NAVORD rept. 5929; NOLC rept. 425; AD-205 586.
Order from LC mi$2.40, ph$3.30 PB 150 073

The suitability of very thin evaporated magnetic alloy films for use in coincident current memory devices in high-speed digital computers is shown. A method of preparing such films is outlined, and two methods of utilizing them in memory devices are presented. The process of magnetization reversal in thin films is discussed. (Author)

Stanford Electronics Labs., Stanford U., Calif.
APPLICATION OF THE MAGNETORESISTANCE EFFECT TO ANALOG MULTIPLICATION, by J. M. Hunt. Rept. on Contract Nonr-225(24). 25 May 60, 132p. 10 refs. Technical rept. no. 1504-1; AD-239 778.
Order from LC mi$6.90, ph$21.30 PB 149 333

Bounds on the performance of a magnetoresistance are studied. Emphasis was placed upon the following areas: (1) analysis of multiplier error in terms of constituent errors, (2) theoretical analysis of the source of certain errors caused by imperfections in the paired magnetoresistor unit which is the novel element of the multiplier, and (3) fabrication and test of sufficient magnetoresistor elements to permit the establishment of a realistic bound on the error component contributed by these elements. Attention also was devoted to methods for minimizing multiplier errors without recourse to external corrective circuitry. (Author)

MECHANICS

Bolt Beranek and Newman, Inc. [Cambridge, Mass.]
DAMPING FLEXURAL VIBRATIONS IN PLATES BY FREE AND CONSTRAINED VISCO-ELASTIC LAYERS. Final rept. on phases I-III of Contract NObs-72452(375). 28 May 59, 118p. 13 refs. Rept. no. 632.
Order from LC mi$6.00, ph$18.30 PB 153 794

This report released for sale to the public 15 Mar 61.

Contents:
Measures of damping effectiveness
General analysis of three-layer plate
Homogeneous damping treatment
Constrained-layer damping treatments
Other damping configurations
Effects of water load and plate curvature
Experimental methods

Bolt Beranek and Newman, Inc., Cambridge, Mass.
MOMENT IMPEDANCE OF PLATES, by Ira Dyer. Rept. on Contract Nonr-2322(00). 30 Mar 60, 31p. 17 refs. Rept. no. 727; AD-234 724.
Order from LC mi$3.00, ph$6.30 PB 153 739

The moment impedance of an infinitely extended plate is calculated with the use of plate equations that allow for finite transverse shear and rotatory inertia. It is shown that the effects of finite transverse shear may be important even for thin plates, a result that is contrary to classical theory. Classical theory is shown to be inadequate for the calculation of moment impedance when the distance over which the moment is applied is smaller than plate thickness. The moment impedance for geometries of greatest practical interest is found to consist of a resistance connected in series with a stiffness reactance, both roughly inversely proportional to frequency, with the reactance of greater magnitude. Both the resistance and the reactance decrease with decreasing distance over which the moment is applied, because of the increasing importance of transverse shear flexibility. The practical implications of the results are discussed, and some thoughts are given concerning other problems where classical theory for flexural waves in thin plates may not be applicable. (Author)

Brown U. Div. of Applied Mathematics, Providence, R. I.
AN ELEMENTARY DISCUSSION OF DEFINITIONS OF STRESS RATE, by William Prager. Technical rept. no. 53 on Contract Nonr-562(10). Feb 60, 11p. 7 refs. C11-53; AD-232 491.
Order from LC mi$2.40, ph$3.30 PB 153 142

A condensed version of this paper was presented at the First All-Union Congress of Applied Mechanics in Moscow (Jan. 27 - Feb. 3, 1960).

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON A PROBLEM OF MINIMUM WEIGHT DESIGN, by Zenon Mróz. Technical rept. no. 59 on Contract Nonr-562(10). May 60, 19p. 14 refs. C11-59; AD-236 729.
Order from LC mi$2.40, ph$3.30 PB 147 402

A problem of optimal design for perfectly plastic, isotropic structures is analyzed. It is shown that for such structures as plates or shells, an extremum of the volume, if it exists, may be either a local maximum or a minimum. (Author)

Brown U. Div. of Applied Mathematics, Providence, R. I.
PLASTIC DEFORMATIONS IN IMPACT AND IMPULSIVE LOADING OF BEAMS, by S. R. Bodner and P. S. Symonds. Technical rept. no. 61 on Contract Nonr-562(10). May 60, 26p. 9 refs. C11-61; AD-239 005.
Order from LC mi$2.70, ph$4.80 PB 148 812

A summary of recent experimental work to evaluate the assumptions of dynamic rigid-plastic theory is presented. The experiments were performed on cantilever beam specimens of mild steel and of aluminum alloy, and tentatively indicate that strain rate effects are the principle cause of discrepancies between theory and experiments. The need to consider the space and time variation of the yield moment in interpreting experimental results is shown, and a mathematical model that incorporates these features is discussed. In a numerical example the predictions of this model are found in excellent agreement with experimental results. (Author)

Brown U. Div. of Applied Mathematics, Providence, R. I.
PLASTIC DEFORMATIONS OF SQUARE PORTAL FRAME UNDER HORIZONTAL IMPACT, by H. Tanaka. Technical rept. no. 60 on Contract Nonr-562(10). May 60, 27p. 5 refs. C11-60; AD-239 004.
Order from LC mi$2.70, ph$4.80 PB 148 811

This paper presents an analysis of the plastic deformations of a square portal frame subjected to a horizontal impact such that the beam instantaneously acquires a horizontal velocity. The results show that

the magnitude of mass of the beam greatly affects the final plastic deformations. Finally, an approximation for the deformations is proposed. (Author)

Brown U. Div. of Engineering, Providence, R. I.
A NOTE ON THE YIELD STRENGTH OF A DUCTILE MATRIX WITH DILUTE CONCENTRATIONS OF RIGID INCLUSIONS, by B. Paul. Technical rept. no. 5 on Contract Nonr-562(19). May 60, 8p. 2 refs.
Nonr 562(19)/5; AD-239 645.
Order from LC mi$1.80, ph$1.80 PB 148 346

A simple model of particle action indicates that the yield strength of a ductile matrix containing a dilute distribution of rigid particles varies linearly with the volume fraction of rigid matter. The slope of the yield stress versus volume fraction curve is shown to be directly proportional to the yield stress of the matrix. (Author)

David Taylor Model Basin, Washington, D. C.
THE STRESSES AROUND A RECTANGULAR OPENING WITH ROUNDED CORNERS IN A BEAM SUBJECTED TO BENDING WITH SHEAR, by S. R. Heller, Jr., J. S. Brock, and R. Bart. Mar 59, 30p. 8 refs. Rept. 1311.
Order from LC mi$2.70, ph$4.80 PB 154 766

This report released for sale to the public 15 Mar 61.

A solution for the stresses around a rectangular opening with rounded corners in the web of a beam subjected to bending with shear is presented. The aspect ratio (height to width) and the radius of curvature of the corners are general. The complex-variable method of Muskhelishvili is used in conjunction with a conformal mapping technique to obtain the solution. Curves showing the tangential stress around the boundary of a typical family of rectangles are presented. In addition, curves are given which show the maximum values of the boundary stress as a function of both aspect ratio and corner radius. The numerical cases are sufficient to cover most openings found in engineering structures. The effect of small eccentricity is given. (Author) (See also PB 154 765)

David Taylor Model Basin, Washington, D. C.
THE STRESSES AROUND A RECTANGULAR OPENING WITH ROUNDED CORNERS IN A UNIFORMLY LOADED PLATE, by S. R. Heller, Jr., J. S. Brock, and R. Bart. Jan 59, 13p. 13 refs. Rept. 1290.
Order from LC mi$2.40, ph$3.30 PB 154 765

This report released for sale to the public 15 Mar 61.

Reprinted from Proceedings of the Third U. S. National Congress of Applied Mechanics held at Brown U., Providence, Rhode Island, June 11-14, 1958.

This paper presents a solution for the stresses around a rectangular opening with rounded corners in a uniformly loaded plate. The aspect ratio (length to width) and the radius of curvature of the corners are general. The complex-variable method of Muskhelishvili is used in conjunction with a conformal mapping technique to obtain a solution. Curves showing the tangential stress around the boundary of a typical family of rectangles are presented. In addition, curves are given which show the maximum values of the boundary stress as a function of both aspect ratio and corner radius. The numerical cases are sufficient to cover most openings found in engineering structures. (Author)

Harvard U. Div. of Engineering and Applied Physics, Cambridge, Mass.
THE STRESS FIELD OF A SLIPPED CRYSTAL AND THE EARLY PLASTIC BEHAVIOR OF POLYCRYSTALLINE MATERIALS, by Bernard Budiansky, Zvi Hashin, and J. Lyell Sanders, Jr. Technical rept. no. 7 on Contract Nonr-1866(02). Apr 60, 35p. 13 refs. AD-235 934.
Order from OTS $1.00 PB 171 531

The initial phases of plastic deformation of polycrystals during which elastic strain predominates was studied. Consideration is given to the stresses in single and double slip systems of crystals. Estimates were made for the initial shape of the stress-strain curve of a polycrystal on the basis of single crystal properties. Interference effects of neighboring slipped grains were neglected. The results obtained for the polycrystal composed of grains indicated that, in the absence of mechanisms of plastic deformation other than slip, such a hypothetical material would need stresses far above the elastic limit for plastic strains to become comparable to elastic strains. This is qualitatively consistent with the behavior of zinc polycrystals, i.e., having but one slip plane per crystal with three possible slip directions per plane, which tend to exhibit very nonductile behavior up to fracture. For a face-centered cubic material, the elastic-plastic material may have an uniaxial stress-strain curve that is asymptotic to the Taylor limit; part of this asymptotic approach is shown. Errors originate not only from the neglect of the influence of multiple slip but also from the neglect of interaction between slipped grains as the concentration approaches 100%.

Institute of Engineering Research, U. of California, Berkeley.
STRESS-STRAIN RELATIONS IN PLASTICITY AND THERMOPLASTICITY, by P. M. Naghdi. Technical rept. no. 9 on Contract Nonr-222(69). Mar 60, 86p. 80 refs. Series 131, issue 9; AD-236 454.
Order from LC mi$4.80, ph$13.80 PB 153 767

Contents:
Isothermal stress-strain relations
- Fundamental concepts. Stress-strain relations
- Subsequent loading surfaces: hardening rules
- Singular regimes and their use with total strain theories

Thermoplasticity
- Non-isothermal plastic deformation
- Basic concepts in irreversible thermodynamics
- Irreversible thermodynamics and plastic stress-strain relations

Lockheed Aircraft Corp., Sunnyvale, Calif.
ON THE ROLE OF BENDING IN THE DYNAMIC RESPONSE OF THIN SHELLS TO MOVING DISCONTINUOUS LOADS, by Pauline Mann Nachbar. Technical rept. on Mathematics. June 60, 55p. 5 refs. LMSD-703021; AD-243 181.
Order from LC mi$3.60, ph$9.30 PB 153 502

Mellon Inst., Pittsburgh, Pa.
NORMAL STRESSES IN SECOND ORDER VISCOELASTICITY, by Bernard D. Coleman and Walter Noll (Carnegie Inst. of Tech.) Rept. on Contract AF 49(638)541 and National Science Foundation Grant NSF-G 5250. Dec 60, 10p. 5 refs. AFOSR-TN-60-1461; AD-248 596.
Order from LC mi$1.80, ph$1.80 PB 153 749

Some predictions are indicated concerning the normal stresses derived from the second order theory of incompressible viscoelastic fluids.

Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
ENERGY OF CRACK FORMATION AND CRACK PROPAGATION UNDER IMPACT LOADING, by Cyril Wells and W. B. Triplett. Rept. for 1 July 58-31 Dec 59 on Mechanisms of Ductility and Fracture, Contract AF 33(616)5830. Aug 60, 71p. 17 refs. ARL Technical note 60-124. AD-248 508
Order from LC mi$4.50, ph$12.30 PB 153 856

A basic study of (a) the relative energies of crack formation and crack propagation and (b) mechanisms of fracture occurring under impact loading has been made. The procedure developed for determining crack formation, crack propagation, and overall impact transition curves from impact versus testing temperature data has been shown to be reliable and to have a wide application. Crack formation, crack propagation, and overall impact energies have been determined for standard V-notch Charpy specimens from several steels having body-centered cubic structures and from an annealed commercial titanium having a close-packed hexagonal structure. For the steels, a determination has been made of the effect on these energies of testing temperature, tensile strength, anisotropy, and composition. Composition variations were small and limited to (a) changes of impurity content, (b) changes of composition within the AISI 4340 limits, and (c) boron plus rare earth additions. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
EXTENSIONAL VIBRATIONS OF ELASTIC SANDWICH PLATES, by Yi-Yuan Yu. Technical note no. 9 on Contract AF 49(638)453. Oct 60, 13p. 2 refs. AFOSR-TN-60-1229; AD-248 301.
Order from LC mi$2.40, ph$3.30 PB 153 639

Three systems of extensional equations of motion of symmetrically arranged three-layered elastic plates are presented. The first system takes into account of thickness-stretch deformation of both the core and face layers, and the second only that of the core, in addition to the extensional deformation of the layers. The third system takes no consideration of thickness-stretch deformation and is thus of the classical type. It is shown that, for ordinary sandwich plates that have relatively thin but heavy and rigid face layers, all three systems of equations yield practically the same result for the lowest branch of the frequency spectrum of extensional vibration of an infinite sandwich plate covering low frequency ranges. For such plates and for such low frequency ranges, consideration of thickness-stretch deformation is therefore unnecessary, in contrast to the case of flexural vibration of such plates, for which the inclusion of thickness-shear deformation of the core is an absolute necessity even for low frequencies. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
FLEXURAL VIBRATIONS OF RECTANGULAR SANDWICH PLATES, by Yi-Yuan Yu. Technical note no. 8 on Contract AF 49(638)453. Aug 60, 18p. 10 refs. AFOSR-TN-60-953; AD-248 073.
Order from LC mi$2.40, ph$3.30 PB 153 638

On the basis of three recently derived systems of flexural equations of motion the free vibrations of infinite sandwich plates in two dimensions and simply supported rectangular sandwich plates are investigated. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
PLASTIC INTERACTION CURVES FOR CIRCULAR CYLINDRICAL SHELLS UNDER COMBINED LATERAL AND AXIAL PRESSURES, by R. Sankaranarayanan. Rept. on Contract Nonr-839(17). May 60, 15p. 3 refs. PIBAL rept. no. 563; AD-237 075.
Order from LC mi$2.40, ph$3.30 PB 147 757

A circular cylindrical shell, made of a rigid perfectly plastic material, is subjected to a lateral pressure P and an axial compressive pressure Q. The shell is built-in at one end and free at the other. The material of the shell is assumed to obey Tresca's yield condition and the associated flow rule. Plastic interaction curves based on a linearized yield surface are obtained for all values of P and Q. (Author)

Aerodynamics and Pneumatics

Aero-Space Labs., North American Aviation, Inc.
EFFECT OF ROUGHNESS ON TRANSITION IN SUPERSONIC FLOW, by E. R. Van Driest and C. B. Blumer. Rept. on Contract AF 49(638)250. Mar 60, 38p. 4 refs. MD 60-329; AFOSR-TN-60-1164.
Order from LC mi$3.00, ph$6.30 PB 153 743

Further experiments carried out to investigate the effect of three-dimensional roughness elements (spheres) on boundary-layer transition on a 10-degree (apex angle) cone without heat transfer are reported. The local Mach number for these tests was 2.71. The data show clearly that the minimum (effective) size of trip required to bring transition to its lowest Reynolds number varies as the one-fourth power of the distance from the apex of the cone to the trip. Use of available data at other Mach numbers indicates that the Mach number influence for effective tripping is taken into account. (Author)

Avco-Everett Research Lab., Mass.
UNSTEADY ABLATION, by Steven Georgiev. Rept. on Contract AF 04(647)278. Sep 59, 25p. 2 refs. Research rept. 94; AFBMD TR-60-180.
Order from LC mi$2.70, ph$4.80 PB 153 568

The transient ablation process for non-radiating glassy materials is discussed and numerical calculations are presented for quartz along an ICBM trajectory. It is shown that the transient effects do not appreciably affect the amount of ablated material along the trajectory, but that they affect very significantly the amount of insulating material required after ablation ceases. The transient ablation analysis is also applied to quartz under arc wind tunnel heating conditions and it is shown that the experimentally obtained ablation history can be used to deduce the high temperature thermal diffusivity of the ablating material. (Author)

Bell Aerosystems Co., Buffalo, N. Y.
A NEW APPROACH TO SAFE FLIGHT FLUTTER TESTING, by Melvin B. Zisfein and Benjamin B. D'Ewart. Rept. on Contracts AF 49(638)749 and AF 49(638)380. Sep 60, 45p. Rept. no. 9015-19-002; AFOSR TN-60-1027.
Order from LC mi$3.30, ph$7.80 PB 152 687

The basic research program was concerned with the synthesis, analysis, and experimental evaluation of a new method of flight flutter testing. The method is based on the well known fact that small changes in mass distribution can drastically change the vibrational properties of an oscillating aero-dynamic surface, and can bring about substantial changes in its flutter speed. This method employs a jet device to simulate the force effects of mass and to create thereby an apparent change in the mass distribution of an aerodynamic surface. This apparent mass change can be easily manipulated to make flutter come or go, and can therefore be used as a safe, fail safe, positive, flight flutter test device. This report presents a very brief historical background, a discussion of the basic principles of "jet mass" and its effect on flutter, and a description of the design details of two jet mass prototypes/and a wind tunnel flutter model. Subsequent sections of this report describe the laboratory and wind tunnel tests on the prototype jet mass systems. The report is completed by a statement of conclusions including recommendations for future jet mass system development. (Author)

Brown U. Div. of Applied Mathematics, Providence, R. I.
TWO INITIAL VALUE PROBLEMS IN ISOTROPIC TURBULENCE, by W. H. Reid. Technical rept. no. 33 on Contract Nonr-562(07). Mar 60, 37p. 3 refs. AD-235 030.
Order from LC mi$3.00, ph$6.30 PB 153 737

Two initial value problems are considered which illustrate the detailed transfer of energy between different wave numbers. In the first problem, the initial energy distribution consists of two line spectra whose subsequent interaction is studied. The resultant distribution of energy transfer consists of three distinct parts: the interaction of two lines with themselves which result in continuum contributions centered about each of the lines and the mutual interaction which results in a further continuum contribution centered about the line located at the larger wave number. In the second problem, the initial energy distribution consists of a line spectrum and a continuous spectrum of the "final period" type. The interaction between these spectra is strongly dependent on the position of the line spectrum relative to the continuous spectrum. In both problems it is found that there is a local transfer in both directions about any given wave number but that the overall transfer is in the direction of large wave numbers. (Author)

Brown U. Div. of Engineering, Providence, R. I.
LINEARIZED TRANSONIC FLOW ABOUT SLENDER BODIES AT ZERO ANGLE OF ATTACK, by P. F. Maeder and H. U. Thommen. Rept. on Contract AF 49(638)444. Oct 60, 40p. 14 refs. Technical rept. WT-34; AFOSR-TN-60-1247; AD-248 228.
Order from LC mi$3.00, ph$6.30 PB 153 644

The simple linearized transonic flow theory as originally proposed by Oswatitsch and Keune (Proc. of the Conference on High-Speed Aeronautics, 1955) and by the present authors (J. Aeronautical Science 23: no. 2, 1956) is improvpd by considering and partially correcting its error. In this manner a theory which is easy to apply and which should be valid for a great number of smooth bodies is obtained. This improved theory predicts shock waves in the lower transonic regime. It is applied to a number of significant body and airfoil shapes and its predictions are compared with experiments and results of other theoretical investigations. (Author)

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
THE TWO-DIMENSIONAL EFFECTS OF SLIPSTREAM SHEAR ON AIRFOIL CHARACTERISTICS, by R. J. Vidal, J. H. Hilton, and J. T. Curtis. Rept. on Contract DA 44-177-TC-439. Sep 60, 93p. 27 refs. Rept. no. AI-1190-A-5; TREC Technical rept. 60-56; AD-246 522.
Order from LC mi$5.40, ph$15.30 PB 153 463

The available theories for two-dimensional airfoils in uniform and non-uniform shear flows of infinite extent are reviewed. An image analysis is presented to make these results applicable to shear flows of finite extent. Experiments with a two-dimensional symmetrical Joukowsky airfoil in uniform shear flow and in simulated two-dimensional propeller slipstreams are described. Results are compared with the applicable theory. The airfoil section characteristics can be predicted with good accuracy at all positions tested in the slipstream. (Author)

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
WEAK, NONEQUILIBRIUM, DIFFUSIVE WAVES IN A DISSOCIATED GAS, by F. K. Moore and J. T. Curtis. Rept. on Contract Nonr-2653(00). Feb 60, 16p. 8 refs. Rept. no. AF-1285-A-1; AD-234 107.
Order from LC mi$2.40, ph$3.30 PB 153 125

A theoretical study is made of the nonsteady diffusive wave produced in a semi-infinite region filled with dissociated gas, initially at rest, when a weak temperature disturbance is imposed at the bounding plane. The effects of 2 specific types of disturbance

are studied: wall temperature varying exponentially with time, and wall temperature undergoing a step-function in time. Finite reaction rates and wall catalycity are assumed. The particular purpose of the present study is to contribute to a qualitative picture of nonequilibrium viscous phenomena, emphasizing analytical solutions of a simple character, which have a bearing, by analogy, on non-linear boundary-layer problems. Especially simple solutions are obtained by assuming that, during a temperature change at constant pressure, the heat absorbed by internal degrees of freedom is much less than the heat of chemical reaction absorbed. This assumption is particularly appropriate at low pressures. (Author)

Frick Chemical Lab., Princeton U., N. J.
THE THICKNESS OF SHOCK FRONTS IN ARGON, by K. Hansen and D. F. Hornig. Technical rept. no. 1 on Contract Nonr-1858(24). 5 Jan 60. 13p. 9 refs. AD-231 480.
Order from LC mi$2.40, ph$3.30 PB 152 895

The accuracy and sensitivity of the optical reflectivity method for determining the thickness of shock fronts were improved. The thicknesses of shock fronts in Ar were measured up to M = 2.38. Most of the effort was concentrated at M = 2.38 where the reciprocal thickness in mean free paths, $1_0/L_0 = 0.234 \pm .007$. At M = 2.38 the front is about 20% thicker than calculated from the Navier-Stokes equations but the thickness agrees very closely with that calculated by Muckenfuss using a bimodal distribution function. (Author)

Institute of Engineering Research, U. of California, Berkeley.
SOME PRELIMINARY RESULTS IN SEPARATED FLOW AERODYNAMICS, by L. L. Lynes and S. A. Schaaf. Rept. on Contract Nonr-222(45). 10 Feb 60, 12p. 2 refs. Rept. no. HE-150-178; Series no. 20, issue no. 133; AD-234 018.
Order from LC mi$2.40, ph$3.30 PB 153 118

A preliminary experimental investigation is reported of separation phenomena on a hemispherically capped cylinder with a conical skirt. It was found that separation existed in the region between the cylindrical body and the forward face of the conical skirt. The separation point was on the shoulder of the hemispherical cap and the reattachment was at or near the heel of the conical skirt. These two points remained nearly fixed as the axial length of the cylinder in front on the conical skirt was increased until a point was reached where the separation point began to slide back along the body. Also, no hysteresis was detected as a function of forward or aft movement of the conical skirt. (Author)

National Research Labs., Ottawa (Canada).
REFLECTION OF A PLANE ACOUSTIC SHOCK BY A SURFACE OF REVOLUTION, by P. Mandl. Aug 60, 104p. 13 refs. Aeronautical rept. LR-289; AD-249 103.
Order from LC mi$5.70, ph$16.80 PB 153 475

The influence of a structure on the pressure field and form of a passing shock wave, and that of the shock wave on the structure, are of considerable practical and theoretical interest. This report extends existing two-dimensional theory to the case of bodies of revolution. Although the resulting series solutions for the general case are rather unwieldy, they permit certain conclusions about the transient loading on a structure as a function of the principal curvatures of its boundaries. When the solutions are applied to the particular case of a spherical reflector, they are considerably simplified, and permit the transient loading and the blast impulse at various positions on the boundary to be calculated, for various forms of incident front. The solutions converge well near the stagnation point but are less satisfactory near the shadow boundary. The results compare well with previous two-dimensional calculations. Certain extensions of the theoretical approach are suggested. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
BLUNT BODY HEAT TRANSFER AT HYPERSONIC SPEED AND LOW REYNOLDS NUMBERS, by Antonio Ferri, Victor Zakkay, and Lu Ting. Rept. on Contract AF 33(616)6118. June 60, 79p. 19 refs. PIBAL rept. no. 611; ARL Technical note 60-140; AD-242 704.
Order from LC mi$4.50, ph$12.30 PB 150 636

An analytical method for the determination of the effect of shock curvature on heat transfer in the region of the nose was developed. For practical body shape the viscous terms in the Navier-Stokes equations are not important in the region of the flow far from the wall and the displacement thckness can be neglected. Then the flow can be approximately represented by an inviscid flow solution having as boundary conditions the body shape, which is not affected by the Reynolds number and by a boundary layer type of flow near the wall, having appropriate boundary conditions. This approach permits us to determine the heat transfer in the region of the nose even at very low Reynolds numbers. Experimental results are presented. The experimental results agree with the values given by the analysis. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
INTEGRAL METHOD BOUNDARY LAYER CALCULATIONS FOR STRONG FAVORABLE STREAMWISE PRESSURE GRADIENTS, by Martin H. Steiger. Rept. on Aerodynamic and Heat Transfer Problems in Hypersonic Flow, Contract AF 33(616)6118. July 60, 17p. 6 refs. PIBAL rept. no. 613; ARL Technical note 60-137; AD-242 171.
Order from LC mi$2.40, ph$3.30 PB 150 327

The two-dimensional, laminar, incompressible boundary layer with strong favorable pressure gradients is investigated. Similar and non-similar solutions are obtained, covering the range of the shape factor $2 < \Lambda \leq \infty$. Similar solutions, corresponding to Λ = constant, are given in closed form. Well-behaved non-similar solutions are derived and an approximate solution for non-similar flows in which $\Lambda > 100$ is given in closed form. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
LAMINAR FLOW IN FINITE POROUS CHANNEL WITH VARIABLE INJECTION OR SUCTION, by Koon-Sang Wan. Rept. on Contract AF 49(638)445. Sep 60, 56p. 9 refs. PIBAL rept. no. 614; AFOSR-TN-60-1197; AD-248 666.
Order from LC mi$3.60, ph$9.30 PB 153 837

An investigation was carried out to obtain the incompressible laminar flow characteristics in a channel with porous walls of finite length in which fluid is being injected or sucked through the channel walls. An approximate solution is obtained based on the variational principle. This solution is expressed in terms of the given, but arbitrary, function characterizing the variation of the injection velocity at the porous walls for any given velocity profile at the entrance to the porous region. It depends on two parameters, the Reynolds number R_e and the nondimensional maximum injection velocity $\overline{v}_o$, both of which are based on a reduced maximum velocity at the entrance. A similarity rule for the present problem is then established. Numerical examples are given for the case where the entrance velocity profiles are "inlet" or parabolic and the injection velocity is a constant or varies linearly. The results of the flow characteristics for these examples for different values of v_o are presented in the form of curves. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
PERTURBED BOUNDARY LAYER SOLUTIONS APPLIED TO THE WALL JET AND BLASIUS PROFILE, by Martin H. Bloom and Martin H. Steiger. Rept. on Contract AF 49(638)217. Oct 60, 40p. 10 refs. PIBAL rept. no. 471; AFOSR-TN-60-1340.
Order from LC mi$3.00, ph$6.30 PB 153 838

Two types of first-order perturbation solutions are investigated. In the first limiting case it is assumed that the zero-order solution is that of a wall jet with zero outer-velocity, and the first-order correction considers the effect of a small outer streamwise flow. The special case of the constant velocity is treated in detail. In the second limiting case the constant pressure Blasius solution is taken as the zero-order solution and the first-order correction is a wall jet type of flow. This investigation considers both two-dimensional and axially symmetric flows. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
RATE CHEMISTRY AND FLOW OF AN AIR-LIKE MIXTURE, by Harold Rosenbaum and Martin H. Bloom. Technical rept. on Aerodynamic and Heat Transfer Problems in Hypersonic Flow, Contract AF 33(616)6118. Aug 60, 38p. 13 refs. PIBAL rept. no. 533; ARL technical note 60-145; AD-246 440.
Order from LC mi$3.00, ph$6.30 PB 153 183

An investigation of the inviscid non-equilibrium molecular dissociation and recombination of a flowing model gas consisting of oxygen and nitrogen is presented here. One reaction and one catalyst each is assumed to describe the rate chemistry of oxygen and nitrogen. Similarly one reaction is used to describe the chemistry of the production of ions. These rate equations, the statistical thermodynamic equations, and the conservation equations are combined to determine the flow field. Four representative calculations were performed. The rate of dissociation of oxygen and nitrogen through normal and oblique shock waves with constant pressure downstream was investigated. Another constant pressure calculation through a normal shock wave was performed to determine the electron density. A complete calculation around a blunt body with prescribed pressure distribution investigates all the flow variables. The final calculation was performed to investigate the effect of a normal shock wave on the wake of a blunt body. Constant pressure was assumed behind the wave in this case. (Author)

Rensselaer Polytechnic Inst., Troy, N. Y.
ON THE MAGNETOHYDRODYNAMIC BOUNDARY LAYER THEORY, by K. T. Yen. Rept. on Contract AF 49(638)23. Sep 60, 22p. 11 refs. TR AE 6004; AFOSR-TN-60-1162; AD-246 623.
Order from LC mi$2.70, ph$4.80 PB 153 262

Boundary layer equations for two-dimensional steady magnetohydrodynamic flows are derived and some physical problems such as the relative order of magnitude of viscous and magnetic terms, the velocity and magnetic field boundary layer thicknesses, etc. are discussed. The momentum and energy integral equations for magnetohydrodynamics are also obtained. Consideration is given to two magnetohydrodynamic flows. The first one is the flow over a flat plate analyzed by Greenspan and Carrier (J. of Fluid Mechanics 6, pt. 1, p. 77-96, July 59). As the pressure ratio $\beta = \mu_e H_0^2 / \rho_\infty U_\infty^2$ approaches one, Greenspan and Carrier showed that the flow is plugged while the magnetic field is annuled. It is shown in this work, however, that there exists another solution when the electric conductivity of the fluid is very large and $\beta = 1$. This solution yields the result that the flow is plugged but the magnetic field is uniform and undisturbed. The second flow is concerned with jet mixing under a magnetic field directed along the jet axis. The flow plugging phenomenon is also found to occur. (Author)

University of Southern California, Engineering Center, Los Angeles.
THE STRUCTURE OF STRONG SHOCK WAVES OF STABLE MONATOMIC MOLECULES, by Toyoki Koga. Technical note on Contract AF 49(638)831. Oct 60, 68p. 19 refs. USCEC rept. 83-201; AFOSR-TN-60-1344; AD-247 335.
Order from LC mi$3.90, ph$10.80 PB 153 428

The present theory of plane shock waves of a monatomic gas is based on three hypothetical assumptions according to which two series of distribution functions are designed. There is no serious mathematical difficulty in solving five equations of moments by which the five unknown variables involved in an assumed distribution function are determined. The results are compared with those of other authors. According to the results, the initial assumptions seem to be plausible as long as the theory is confined in a limited domain of interest so that moments of higher orders with respect to c_y and c_z are not involved in the theory. (Author)

Vidya, Inc., Palo Alto, Calif.
AERODYNAMIC APPLICATIONS OF PLASMA WIND TUNNELS, by Jackson R. Stalder, Frederick K. Goodwin and others. Rept. for July-Dec 59 on Research on Aerodynamic Flow Fields, Contract AF 33(616)6704. Dec 60, 126p. 23 refs. WADD Technical note 60-1.
Order from LC mi$6.30, ph$19.80 PB 152 582

An investigation has been made of the use of arc-heated plasma wind tunnels to determine their usefulness in aerodynamic and thermodynamic experimentation. In order to establish the range of aerodynamic and thermodynamic variables of interest trajectories have been calculated for representative hypersonic vehicles of current and future interest. From these trajectories, the pertinent aerodynamic and thermodynamic variables have been calculated and plotted. A parametric study has been made of the characteristics produced by arc-heated plasma wind tunnels. These calculations were made for flow in chemical equilibrium and for flow whose chemical composition was frozen at stagnation conditions. These two cases will bracket any case where the flow is initially in equilibrium and freezes in composition during its expansion in a supersonic nozzle. The vehicle characteristics, in conjunction with the wind-tunnel characteristics, then permit a comparison between aerodynamic and thermodynamic variables encountered in flight and those conditions produced by arc-heated plasma wind tunnels operating under a wide range of initial or stagnation conditions. (Author)

Hydrodynamics, Hydraulics, and Hydrostatics

Army Transportation Research Command, Fort Eustis, Va.
OFFSHORE DISCHARGE (PNEUMATIC WAVE ATTENUATION FULL-SCALE TANK TESTS), by Stuart N. Sherk. Engineering rept. on Proj. 9R98-05-010, House Task 14.63. Dec 60, 112p. 22 refs. TREC Technical rept. 60-26; AD-247 470.
Order from LC mi$6.00, ph$18.30 PB 153 416

This study covers an investigation of the practicability of utilizing rising air bubbles in water to achieve height attenuation of ocean-size waves. Basic wave theory, oceanographic definitions, and operating principles of pneumatic wave attenuation are presented primarily as they apply to inshore ocean wave areas. Specific interest in concept application is directed toward increasing Transportation Corps capabilities in the discharge of ships' cargo in offshore operations. Details of a full-scale tank test are given; and, to confirm the validity of the results and figures presented and to clarify some of the basic concepts of pneumatic wave attenuation, basic theory, sample calculations, problems, and derivations are shown. (Author)

Chesapeake Bay Inst., Johns Hopkins U., Baltimore, Md.
SURFACE WAVES AT SHORT FETCHES AND LOW WIND SPEEDS. A FIELD STUDY, VOLUME 1, by Blair Kinsman. Rept. on Contract Nonr-248(20). May 60, 191p. 50 refs. Tehnical rept. 19; Reference 60-1; v. 1; AD-241 166.
Order from LC mi$8.70, ph$30.30 PB 149 891

A study of 24 point records of surface waves made at short fetches and low windspeeds is reported. It is found that the characteristic departure of the observed distribution of water heights from the Gaussian consists of an elevation of the positive tail, a depression of the negative tail, and a shifting of the mode toward negative values. The deformation is more pronounced for shorter fetches and lighter winds. Evidences of nonlinear interaction are found in the wave spectra, which tend to support the suggestion that a nonlinear theory of surface waves should be carried at least to third order for realistic results. It is found that for sharply peaked spectra the equilibrium range may not begin until frequencies are reached greater than three times the frequency at which the maximum power is located. (Author)

David Taylor Model Basin, Washington, D. C.
ON THE STATISTICAL MECHANICS OF GRAVITY WAVES, by J. Kampé de Fériet (U. of Lille). Jan 60, 11p. 2 refs. Rept. 1370.
Order from LC mi$2.40, ph$3.30 PB 154 767

This report released for sale to the public 15 Mar 61.

Methods of statistical mechanics have been applied to study gravity waves. The waves are assumed to be progressing in the direction of the positive x-axis and their elevation $\eta(x, t)$ is considered as an almost periodic function of x and the time t. Special consideration is given to the case when the distribution of wave numbers follows the Poisson law. (Author)

Hydrodynamics Lab., Calif. Inst. of Tech., Pasadena.
THE ANALOGY BETWEEN SURFACE WAVES IN A LIQUID AND SHOCKS IN COMPRESSIBLE GASES, by H. E. Crossley, Jr. Memo. rept. on Experimental Study on Wave Forms, Contract NOrd-9612. Apr 49, 15p. 2 refs. Rept. no. M-54.2.
Order from LC mi$2.40, ph$3.30 PB 154 745

This report released for sale to the public 16 Mar 61.

Measurements to determine wave strength and velocity should not be made too near the generator: a distance greater than 20 inches is desirable. A wave of given strength can be generated by a proper choice of initial water depth in the ripple tank and of air inlet diameter on the generator. To minimize decay of wave strength, a large generator head and a small air inlet diameter should be used. Waves identical within experimental error will be created by the two available generators if the water is raised in the generators to a height between 19 and 21 centimeters. The addition of a detergent to the working fluid results in smoother waves and steeper wave fronts for shock waves of intermediate strength, but causes accentuation of the oscillatory nature of weaker waves. (Author)

Institute of Engineering Research, U. of California, Berkeley.
WATER WAVES. IV, by E. V. Laitone. Rept. on Contract Nonr-222(30). Nov 59, 95p. Series no. 82, issue no. 11; AD-229 400.
Order from LC mi$5.40, ph$15.30 PB 150 510

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The limiting height and velocity of propagation of cnoidal and solitary waves

Lockheed Aircraft Corp., Sunnyvale, Calif.
HYDROFOILS. AN ANNOTATED BIBLIOGRAPHY, by K. D. Carroll. Sep 60, 39p. 85 refs. Special bibliography SB-60-36; AD-244 916.
Order from OTS $1.00 PB 171 502

This bibliography is the result of a brief investigation of recent developments in hydrofoil design and testing. Items have been selected from the holdings of the Technical Information Center Lockheed Missiles & Space Division, and, to some extent, the Armed Services Technical Information Agency. The reports issued by the National Aeronautics and Space Administration were not exhaustively checked; however, a number of these documents were selected from their more recent publications that are in the LMSD Technical Information Center. (Author)

Michigan U., Ann Arbor.
HYDRODYNAMIC STABILITY AND THE INITIAL VALUE PROBLEM, by K. M. Case. Research sponsored by ONR. 14 Apr 60, 15p. 9 refs. AD-240 618.
Order from LC mi$2.40, ph$3.30 PB 149 782

National Research Labs., Ottawa (Canada).
ANALYSIS OF NEW BED-LOAD TRANSPORT DATA IN TERMS OF MEYER-PETER-MULLER, REGIME "THEORY", AND H. A. EINSTEIN FUNCTIONS, by D. J. Knapp. 25 Aug 60, 34p. 4 refs. Mechanical engineering rept. MH-100.
Order from LC mi$3.00, ph$6.30 PB 154 339

The twofold purpose of this report is to publish new bed-load transport data in the form of the Meyer-Peter-Müller, Regime "theory", and H. A. Einstein analyses, all of which are well known, and to give an appreciation, criticism and comparison of each of these methods, particularly regarding their application to grain size mixtures of varying specific gravity. Of these three, the first two were found to define the rate of transport within the narrowest limits but neither was considered capable of exact quantitative bed-load prediction. For each of the three analyses these new data have extended the range of previous experimental observation in the direction of the threshold of bed-load transport. (Author)

Reed Research, Inc., Washington, D. C.
RESEARCH TO WORK OUT A THRUST DEDUCTION EVALUATION OF THE SUBMARINE ALBACORE (THE CONSTRUCTION OF THE TOTAL HARMONIC VELOCITY FIELD AROUND A GENERAL ELLIPSOIDAL SUBMARINE WITH ONE PROPELLER), by Johann Martinek, Henry de Beaumont, and Gordon C. K. Yeh. Final rept. (II) on Contract Nonr-2192(00). 1 Aug 58, 25p. 4 refs. AD-218 852.
Order from LC mi$2.70, ph$4.80 PB 154 431

This report released for sale to the public 8 Mar 61.

Necessary details are given in reference to the Green's function of first kind pertaining to the Dirichlet problem. Then the Neumann function for the general ellipsoid is derived. Considerations of a more general nature and interest are discussed which are concerned with the construction of the most general types of solutions in terms of the derived Green or Neumann function, which finally solves any type of related problem. (Author)

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
EFFECTS OF END CURRENT LOOPS ON THE VELOCITY PROFILE IN A MAGNETOHYDRODYNAMIC CHANNEL, by A. W. Carlson and G. W. Sutton. Rept. on Contract AF 49(638)914. Dec 60, 39p. 2 refs. Technical Information Series R60SD439; AFOSR-TN-60-1183. AD-248 631.
Order from LC mi$3.00, ph$6.30 PB 153 835

The effect of the end current loops on the velocity profile in a magnetohydrodynamic flow has been investigated for incompressible inviscid flow in a rectangular channel. The end current loops interact with the applied magnetic field to produce Lorentz forces. In the entrance region of the channel, the Lorentz forces vary in magnitude and direction. This variation of the Lorentz forces causes the velocity of the fluid to increase near the walls of the channel and to decrease near the center. The ratio of the changes in velocity to the initial velocity is directly proportional to the interaction parameter $\frac{\sigma B \phi_0}{\rho U^2}$. For a value of $\frac{\sigma B \phi_0}{\rho U^2} = 0.25$, the maximum change in velocity is 10% of the initial velocity. (Author)

Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF HYDROGEN ON THE MECHANICAL PROPERTIES OF TITANIUM AND TITANIUM ALLOYS, by G. A. Lenning, C. M. Craighead, and R. I. Jaffee. Summary rept. no. 3, 1 Aug 53-31 July 54, on Contract DA 33-019-ORD-938. 31 July 54, 99p. 6 refs. WAL 401/79-31.
Order from LC mi$5.40, ph$15.30 PB 154 749

This report released for sale to the public 15 Mar 61.

Results are given on the effect of notches, testing speed, and testing temperature on hydrogen embrittlement of high-purity titanium, commercial purity titanium (A-55), and the commercial 8 per cent manganese alloy (C-110M). The effect of hydrogen on the microstructure and mechanical properties of alpha-beta and beta titanium-molybdenum alloys is presented. Hydrogen pickup of A-55 and C-110M titanium alloys in sodium hydride and Virgo descaling and acid pickling was also investigated. The removal of hydrogen by vacuum annealing of A-55 and C-110M titanium was studied. (Author)

Birmingham U. (Gt. Brit.)
RESEARCH ON STRAIN-AGEING, HARDENING AND SOFTENING OF METALS BY FATIGUE. PART I. FATIGUE OF ALUMINIUM-MAGNESIUM ALLOYS. PART II. FATIGUE OF ZINC SINGLE CRYSTALS, by G. W. J. Waldron, T. Broom, and J. M. Summerton. Technical (final) rept. on Contract AF 61(514)1182. Aug 60, 88p. 26 refs. AFOSR-TR-60-170. AD-246 965
Order from LC mi$4.80, ph$13.80 PB 153 298

As-extruded aluminium-magnesium alloys have high ratios of fatigue to tensile properties, and their S-N curves show fatigue limits. Polycrystals of aluminium and aluminium-magnesium show hardening behaviour after fatigue. Evidence is advanced for supposing that the lowest stress for fatigue failure in aluminium and aluminium-magnesium alloys may be correlated with the stress for beginning of cross-slip. Zinc single crystals have been fatigued at -196°, -78° and +20°C, in push-pull tests at 100 c/s. Stresses of the order of one hundred times the flow stress of a virgin crystal can be reached. These results suggest that point defects contribute to the hardening. (Author)

Crucible Steel Co. of America, Midland, Pa.
INVESTIGATION TO DEVELOP OPTIMUM PROPERTIES IN FORGED Ti-7Al-4Mo, by James E. Hamer. Rept. for Feb 58-June 60 on Metallic Materials, Contract AF 33(616)6122. Oct 60, 145p. 8 refs. WADD Technical rept. 60-489.
Order from OTS $2.75 PB 171 546

The influence of six processing sequences on the microstructure, mechanical properties, and heat treatment response of the Ti-7Al-4Mo alloy has been studied. Forging entirely above the beta transus produced a Widman-statten type of structure. The creep resistance of this structure was excellent; however, heat treatment response and tensile ductility were poor. Forging entirely below the beta transus developed an equiaxed microstructure and generally good properties except for reduced creep resistance. Duplex forging, i.e., forging initially above the beta transus, cooling to room temperature, and reheating to below the beta transus for finish forging, produced a nearly equiaxed microstructure and general property levels quite similar to all below-beta forging but with improved creep resistance. (Author)

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
DESIGN PROPERTIES AS AFFECTED BY CRYOGENIC TEMPERATURES (Ti-6Al-4V, AISI 4340, AND 7079-T6 ALLOYS), by W. P. Achbach and R. J. Favor. Rept. on Contracts AF 33(616)6410 and AF 33(616)7747. 24 Jan 61, 19p. 5 refs. DMIC memo. 81.
Order from OTS $0.50 PB 161 231

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EVOLUTION OF NICKEL-BASE PRECIPITATION-HARDENING SUPERALLOYS, by J. G. Hoag. [Rept. on Contract AF 33(616)7747]. 6 Feb 61, 11p. 18 refs. DMIC memo. 84.
Order from OTS $0.50 PB 161 234

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
PICKLING AND DESCALING OF HIGH-STRENGTH HIGH-TEMPERATURE METALS AND ALLOYS, by J. A. Gurklis and L. D. McGraw. [Rept. on Contract AF 33(616)7747]. 8 Feb 61, 17p. 28 refs. DMIC memo. 85.
Order from OTS $0.50 PB 161 235

The purpose of this memorandum is to bring together a partial selection of chemical and electrochemical descaling and pickling procedures that have been employed on the high-strength, high-temperature metals and alloys.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
REVIEW OF DEVELOPMENTS IN IRON-ALUMINUM-BASE ALLOYS, by J. W. Holladay. [Rept. on Contract AF 33(616)7747]. 30 Jan 61, 61p. 99 refs. DMIC memo. 82.
Order from OTS $0.50 PB 161 232

The iron-aluminum alloys are of interest as an alternative to titanium. The present memorandum reviews the current developments in the iron-aluminum alloys and includes the essential data from two previous memorandums.

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ANNEALING OF OBLIQUE-INCIDENCE PERMALLOY FILMS, by G. P. Weiss and D. O. Smith. Rept. on Contract AF 19(604)7400. [1960] 9p. 3 refs. 53G-0046; AD-248 363.
Order from LC mi$1.80, ph$1.80 PB 153 701

The anisotropy of evaporated Permalloy films (composition near zero magnetostriction) deposited on glass at 45° to the substrate normal and at a substrate temperature of 200°C has been studied after anneal for several hours at 300°C. After anneal the room temperature easy-axis of films with positive magnetostriction is in the original direction. However, films with negative magnetostriction develop a new room temperature easy-axis 90° to the original one; at 300°C the easy-axis is in the original direction. Application of a large magnetic field in any direction during anneal does not influence the final magnetic anisotropy in either case. These effects are qualitatively explained by assuming the anneal to increase the tension along the long-axis of oblique-incidence chains, a process which converts surface energy into strain energy. Anisotropy was measured by resonance in a coaxial bridge over the frequency range 50 Mc to 2100 Mc. A rectangular coaxial cavity is used which can be heated to 500°C in a vacuum of 10^{-6} mm Hg; continuous angular orientation of the film is possible with a resolution of ± 0.5°. Bridge balance is good enough to permit samples of less than 100 Å thickness to be measured. (Author)

National Research Labs., Ottawa (Canada).
ON THE FURNACE REQUIREMENTS FOR THE MECHANICAL TESTING OF MATERIALS AT ELEVATED TEMPERATURE, by J. A. Dunsby. Nov 60, 35p. 22 refs. Mechanical engineering rept. MS-103.
Order from LC mi$3.00, ph$6.30 PB 154 340

A review is made of the sensitivity to temperature change of the results of tensile, creep, stress rupture and fatigue tests on typical engineering metals. The temperature sensitivity is then used as the basis for an examination of the temperature tolerances specified by the existing standard codes for elevated temperature testing. Guidance is also given for tolerances for elevated temperature fatigue testing, for which no standard codes exist at present. The rate at which a specimen is brought to test temperature is shown to be of some importance and is a design parameter not covered by the standard codes. Suggestions are made for suitable heating rates. (Author)

Naval Weapons Plant, Washington, D. C.
FRACTURE TOUGHNESS OF HIGH STRENGTH SHEET METALS, by Harold Bernstein and George C. Young. Progress rept. no. 2. 28 Jan 60, 26p. 3 refs. NAVORD rept. 6496 (Part 2); NWPW-T-35-59; AD-233 380.
Order from LC mi$2.40, ph$4.80 PB 153 928-2

This report released for sale to the public 15 Mar 61.

Fracture toughness results on several high strength sheet steels are presented. Crack extension force (Gc) values now include a plastic zone correction. The data cover the effects of heat treatment, section size, and directionality. On the basis of the toughness data alone, the low alloy and high silicon steels show promise of reaching the higher strength regions. There was no indication of temper brittleness in any of the materials examined. AMS 6434 showed a pronounced size effect on fracture toughness. The fracture toughness test is more sensitive to temperature than the Charpy impact test. Fracture appearance is not necessarily a valid measure of toughness. (Author) (See also PB 153 928-1)

Naval Weapons Plant, Washington, D. C.
FRACTURE TOUGHNESS TESTS OF HIGH STRENGTH SHEET METALS, by Harold Bernstein and George C. Young. Progress rept. 18 May 59, 23p. 3 refs. NAVORD rept. 6496; NGF T-7-59; AD-219 361.
Order from LC mi$2.70, ph$4.80 PB 153 928-1

This report released for sale to the public 15 Mar 61.

The significance of the fracture toughness test and the notch variable are briefly discussed. Toughness data for numerous high strength sheet steels and one titanium alloy are presented. The data cover the effects of heat treatment, section size, welding, and surface finish. (Author)

Ferrous Metals

Armour Research Foundation, Chicago, Ill.
IMPROVEMENT OF MECHANICAL PROPERTIES OF STEEL CASTINGS BY PRESS FORGING, by T. Watmough, J. T. Berry, and P. R. Gouwens. Final technical engineering rept. for 24 Jan 58-29 Feb 60 on Contract AF 33(600)36387. Sep 60, 116p. 31 refs. AMC Technical rept. 60-7-637.
Order from OTS $2.50 PB 171 524

Steel castings for high performance aircraft and missiles are markedly improved in strength by the application of a press forging operation accomplished under controlled conditions of temperature and deformation. The most suitable alloys for the technique are low-carbon, high-alloy types of steel where the martensite can sustain deformation. The casting alloys of this type investigated were AMS 5363A (an 18-8 stainless), and 17-4 PH stainless steels. In the former, strength increases of 400-600% in yield strength and 200-250% in UTS were obtained by press forging at -100°F with 40% deformation, followed by tempering at 650°F. In the case of the 17-4 PH steel increases in both yield and UTS of approximately 10% were obtained by deforming the predominantly martensitic structure 10% at room temperature followed by aging at 860°F. SAE 4340 is responsive to strengthening by warm working, prior to transformation and at the 240,000 psi strength level; the yield point can be increased by 15 per cent and the UTS by 10 per cent. The composition of 4340 is not entirely suited to these techniques. Utilization of the process with the low-carbon, high-alloy steels is feasible but not without certain difficulties. These involve the design of closed dies of adequate strength to press forge at the lower temperatures. Selective press forging of critical areas in castings by semi-open die techniques, is perfectly feasible.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
HIGH-STRENGTH-STEEL FORGINGS, by H. J. Henning and F. W. Boulger. Rept. on Contract AF 33(616)7747. 5 Jan 61, 64p. 9 refs. DMIC rept. 143.
Order from OTS $1.75 PB 151 102

This report is mainly concerned with forgings made from martensitic steels heat treated to strengths ranging from 240,000 to 300,000 psi. Forging characteristics, design limitations, dimensional tolerances, and quality-control problems are discussed. A considerable amount of data on mechanical properties is also presented. In addition, the report summarizes the available information on forged, semi-austenitic steels. This compilation is based on published articles, Government reports, and interviews with producers and users of steel forgings. (Author)

Engineering Div., Air Materiel Command, Wright-Patterson AFB, Ohio.
FATIGUE LIMIT OF CHROMIUM PLATED STEEL, by Louis Mehr, T. T. Oberg and J. Teres. 26 July 44, 83p. AF Technical rept. 5125; ATI-29 321.
Order from LC mi$4.80, ph$13.80 PB 154 759

This report released for sale to the public 16 Mar 61.

The purpose of this investigation was two-fold; (a) A systematic study and evaluation of the effect of the possible variables on the fatigue limit. (b) The development of a process which would have such a low fatigue loss that the necessity for testing of each plated part could be dispensed with. This latter objective was not completely realized but several desirable conditions were established.

Franklin Inst., Philadelphia, Pa.
EFFECT OF SINGLE TRACE ALLOY ADDITIONS ON THE PROPERTIES OF PURE IRON, by G. London, J. L. Rutherford and others. Rept. for 15 Mar 57-30 June 60 on Interactions, Imperfections and Alloy Theory, Contract AF 33(616)5059. Dec 60, 72p. 11 refs. ARL Technical rept. 60-295.
Order from OTS $2.00 PB 171 045

This study covers the introduction of single trace alloy additions (zero to 0.1 per cent) into zone purified iron. The elements studied were phosphorus, sulfur, cobalt, chromium and nickel. Radio-active tracer techniques were utilized as a tool to determine relative alloy concentration. Purification of the iron was accomplished in 3/16 inch diameter and 1 inch diameter bars by a verticle floating zone technique using 10 zone passes to accomplish initial purification. In the concentration levels studied the specific alloys had the usual grain refining effects on recrystallization; however, even in the zone purified and unalloyed material, recrystallization was influenced by the residual impurities. Alloy effects on mechanical properties were slight except for low temperature embrittlement and room temperature strengthening due to phosphorus. The yield strength temperature relationship for these high purity iron differ from that of ingot iron or mild steel in that the majority of the data shows a linear relationship rather than hyperbolic. Only the high phosphorus material tested indicated the hyperbolic type curve usually attributed to iron. (Author)

Indiana Steel and Wire Co., Inc., Muncie.
INDUSTRIAL PREPAREDNESS STUDY ON NON-NICKEL BEARING ALLOY BRAID WIRE, by Alvin W. Holmes and Paul R. Judy. Final rept. for 24 June 57-31 July 58 on Contract DA 36-039-sc-75929. [1958] 24p. AD-201 450.
Order from LC mi$2.70, ph$4.80 PB 154 419

Fourteen bundles (2,400 lbs.) of cleaned 1/4" Special Alloy Steel were received from Allegheny-Ludlum Steel Corporation. One coil was as hot rolled the others annealed prior to cleaning. Several stringer tests established processing for this material to very much like Type 302 except cleaning must be carefully watched to avoid excessive steel losses and final stock size needed to be smaller because this "Special Alloy" work hardens at a greater rate than average Type 302, both of which increase overall processing costs. Final stock size was determined to be .040" nominal as conductive to best finished wire by our practices. The drawing, testing and packing of approximately 2,000 lbs. of .015" wire was completed. The wire meets the specification requirements almost 100%, the only discrepancy being six torsion tests (out of seven hundred performed) which ranged 13 to 14.5 in one inch length versus 15 minimum specified. Wire produced would be considered brittle (compared to Type 302); while samples of all the wire produced would wrap on one wire diameter, most of it would break on sharp kink test. There were no unusual difficulties at any stage in the processing of this wire. (Author)

Light Metals

Armour Research Foundation, Chicago, Ill.
INVESTIGATION OF HEAT TREATMENT AND WELDING CHARACTERISTICS OF B 120 VCA TITANIUM ALLOY SHEET, by John F. Rudy, Frank A. Crossley, and Harry Schwartzbart. Final rept. for 28 Nov 58-28 July 60 on Contract NOa(s) 59-6054c. [1960] 124p. ARF 2164-12.
Order from LC mi$6.30, ph$19.80 PB 153 565

Aging experiments were carried out between 700 and 1000°F for durations of 2 to 400 hours. Both cold rolling, as a pre-age treatment, and duplex aging showed important advantages in tensile properties over the commercially popular solution-treat-and-age sequence. Duplex aging cycles gave more promising weld metal properties than did isothermal aging. Magnetic stirring, a weld deposition technique intended to refine the weld metal grains and to increase weld metal homogeneity, showed improved tensile properties in duplex-aged weldments. The aging behavior of the alloy after the various pre-age thermal and mechanical treatments, and as a function of the aging cycle per se, is discussed in terms of tensile properties, hardness, microstructure, and published TTT diagrams for the subject alloy. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
VACUUM MELTING OF BERYLLIUM BY ELECTRON BOMBARDMENT, by H. T. Sumsion and C. O. Matthews. Technical rept. on Contract NOrd 17017. Dec 59, 41p. 5 refs. LMDS-480485; AD-232 993.
Order from OTS $1.25 PB 171 521

A process is described for melting and casting beryllium ingots by electron bombardment, in order to produce a beryllium or beryllium-alloy ingot for fabrication into plate. Results are furnished of visual inspections, metallographic examinations, chemical and X-ray diffraction analyses, and machinability, hardness, tensile strength, and bend tests. The effects of variables in both the melt stock and the processes are reported. It is concluded that smooth, homogeneous ingots three inches in diameter and essentially free of casting defects can be produced by the process described. Vaporization loss during melting is not prohibitive for successful production. Ingots produced show improved cast structure and better machinability than induction-melted, vacuum-cast material. Oxide content is reduced but no significant increase in ultimate tensile strength, or decrease in metallic impurities, was obtained. A method of analysis by gamma-activation was developed and proved effective for determinations of oxygen and carbon. (Author)

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
A NEW TYPE OF LIGHTWEIGHT CELLULAR MATERIAL, by L. Polonsky and S. Lipson. Apr 60, 66p. 3 refs. Rept. no. R-1534; AD-242 924.
Order from OTS $1.75 PB 161 770

A process for the production of cellular metals is described. The process consists of preparing a refractory mold, filling the mold with soluble granules which correspond to the size and shape of the pores desired in the metal, and infiltrating the molten metal into this soluble aggregate. After leaching with a suitable solvent, the metal has a void structure of interconnecting cells which correspond to the shape and size of the soluble aggregate. The apparent density of the metal body can be controlled from a maximum of approximately one-third of its base density to some lower density in the order of one-fifth the base density. In addition to process development, which includes casting of shapes as well as billets, a limited investigation of the mechanical and thermal characteristics of aluminum-base cellular metal was made. Potential applications for materials of this type are suggested. (Author)

Nonferrous (except light) Metals

Carnegie Inst. of Tech., Pittsburgh, Pa.
TEMPERATURE DEPENDENCE OF INTERNAL FRICTION OF MAGNESIUM, COPPER, AND ALUMINUM SINGLE CRYSTALS, by John T. Pittenger. Doctoral thesis. Technical rept. on Contract N6ori47, T.O. 1. 10 Aug 51, 108p. 30 refs. ATI-173 115.
Order from LC mi$5.70, ph$16.80 PB 154 867

This report released for sale to the public 17 Mar 61.

Apparatus for determining the temperature dependence of internal friction in the kilocycle range of frequencies is described. The measure of internal friction is the logarithmic decrement. The apparatus was used to determine the temperature dependence of the internal friction of single crystals of 99.96 per cent pure magnesium, 99.999 per cent pure copper, and 99.99 per cent pure aluminum. The decrement of copper showed a minimum near 215°C. A broad minimum occurred in the decrement of magnesium near 60°C. When the temperature of magnesium was changed below 100°C, the decrement increased. The decrement then decreased to a steady value at the new temperature. The decrease has been named aging. The aging process appeared to have an activation energy of about 7000 cal./mole. These results permit definition of a critical temperature for each of the two metals. Above the critical temperature the decrement increased rapidly as the metal was heated. Below the critical temperature the decrement may be increased by small mechanical influences or by strain accompanying cooling. (Author)

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
PHYSICAL AND MECHANICAL PROPERTIES OF COMMERCIAL MOLYBDENUM-BASE ALLOYS, by J. A. Houck. Rept. on Contract AF 18(600)1375. 30 Nov 60, 182p. 63 refs. DMIC rept. 140.
Order from OTS $3.00 PB 151 099

A compilation of the more important physical and mechanical properties of molybdenum and commercial molybdenum-base alloys is presented. Included among the alloys are: Mo-0.5Ti, Mo-0.5Zr, Mo-0.5Ti-0.08Zr (TZM), Mo-0.05Zr, Mo-30W, Mo-50W, and Mo-1.25Ti-0.5Zr-0.15C (TZC). (Author)

Universal-Cyclops Steel Corp., Bridgeville, Pa.
MELTING, FABRICATION AND TESTING OF CHROMIUM BASE ALLOYS, by N. R. Harpster. Final rept. on Contract NObs-72042. 27 Jan 60, 38p. 4 refs.
Order from LC mi$3.00, ph$6.30 PB 153 592

This report released for sale to the public 15 Mar 61.

This report summarizes melting and fabrication experience on chromium-base alloys containing nickel and/or iron as second major elements. Small ingots from all compositions, except 100% chromium, could be forged to bar. Fabrication of wrought product from production size heats was accomplished only with the 50% chromium - 50% nickel alloy. Limited property tests showed the 50% chromium - 50% nickel composition had low stress-rupture strength at 1800°F and 2000°F, poor impact strength at room temperature, limited bend formability and poor welding characteristics. Tests conducted at the Bureau of Ships on the 50% chromium - 50% nickel and 60% chromium - 40% iron alloys showed that both had corrosion and oxidation resistance superior to Type 310 stainless.

Carnegie Inst. of Tech., Pittsburgh, Pa.
SELF DIFFUSION IN THE IRON-CHROMIUM SYSTEM, by H. W. Paxton and T. Kunitake. Technical rept. on Contract Nonr-760(08). 1 Mar 60, 31p. 26 refs. AD-234 184.
Order from LC mi$3.00, ph$6.30 PB 153 742

The self diffusion coefficients of chromium and iron in the Fe-Cr system have been measured or collected from published work. The variation of D_{Cr}^{*} with composition at 1275°C is the largest yet observed in an alloy system - of order 10^4 difference in rates between pure chromium and a 30 Cr - 70 Fe alloy. The variation of D_{Fe}^{*} is much less at this temperature (about a factor of 10 difference in rates over the same composition range). The values of D_0 and Q for both iron and chromium self-diffusion show large variations with composition. The effect of composition is rather complex, but is essentially of the same form for both elements. The currently accepted theories on the vacancy mechanism of diffusion provide no obvious explanation of the results. The concepts of ring diffusion and correlation require more detailed theoretical work before proper comparison can be made. Experiments to shed light on diffusion mechanisms in the b. c. c. transition elements which are of very considerable present and future technological importance seem most desirable. (Author)

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
PHYSICAL AND MECHANICAL PROPERTIES OF TUNGSTEN AND TUNGSTEN-BASE ALLOYS, by V. D. Barth. Rept. on Contract AF 18(600)1375. 15 Mar 60, 67p. 58 refs. DMIC rept. 127; AD-236 095.
Order from OTS $1.75 PB 151 084

The mechanical and physical properties of tungsten and tungsten-base alloys are reviewed and summarized. In an appraisal of mechanical properties, the effects of the ductile-brittle transition and of recrystallization must usually be taken into account. Tensile properties of tungsten up to the melting point have been measured. A considerable amount of work in the field of tungsten-base alloys remains to be done. Physical properties of tungsten have been fairly well established as the result of developments in the lamp and electron tube industries. The relatively poor-temperature oxidation resistance of tungsten may present a problem in elevated-temperature environments. (Author)

Metals and Ceramics Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
APPLICABILITY OF PRESENT CREEP PREDICTION TECHNIQUES FOR EXTRAPOLATING VERY LONG TIME CREEP BEHAVIOR, by K. D. Shimmin. Rept. for Feb-July 60 on Metallic Materials. Oct 60, 21p. 16 refs. WADD Technical rept. 60-523.
Order from OTS $0.75 PB 171 487

A number of methods of correlation and extrapolation of creep and stress-rupture data are reviewed and discussed briefly. It is shown that, of the time-temperature parameter correlation methods, the Manson-Haferd parameter method has been most successful in correlating existing data. Of the empirical methods of extrapolation, the graphical method of Grant and Bucklin, and the statistical approach reported by Clauss are shown to hold promise as a means of predicting long-time creep data. Recommendations are given for an experiment to provide verification and evaluation of the methods of extrapolation of long-time data. (Author)

Metals and Ceramics Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
STUDY OF RATE CONTROLLED PROCESS FOR COMPRESSIVE DEFORMATION OF HIGH PURITY ALUMINUM, by A. E. Riesen. Rept. for July 58-July 60 on Metallic Materials. Sep 60, 27p. 7 refs. WADD Technical rept. 60-542.
Order from OTS $0.75 PB 171 488

A unique testing technique for determining the rate-controlling process for compressive deformation of high purity aluminum over the temperature range of 297°K is discussed, and an attempt is made to correlate the activation energy for compression with some recognized rate-controlling process for tensile deformation of aluminum. It is shown that the compressive activation energy obtained, 5,400 cal/mol., cannot be related to any known tensile deformation process. The results of this study indicate a need for further experimental investigations to define the compression activation energy spectrum for aluminum over a broad temperature range. (Author)

Minnesota U., Minneapolis.
THE EFFECT OF STRESS MAGNITUDE AND STRESS HISTORY ON THE DAMPING, ELASTICITY AND FATIGUE PROPERTIES OF METALLIC MATERIALS, by L. J. Demer and B. J. Lazan. Rept. on Contract N8-ONR-66207. Sep 53, 64p. 53 refs. AD-26 069.
Order from LC mi$3.90, ph$10.80 PB 154 818

This report released for sale to the public 17 Mar 61.

Unnotched cylindrical test specimens of gray cast iron, Sandvik steel, N-155 alloy, 24S-T4 Al alloy, J-1 Mg alloy, and SAE 1020 steel were tested in the rotating beam damping, elasticity, and fatigue machines. The results of vibration decay tests indicate that the specific damping energy (D) increases as a power function of the stress(S): $D = JS^n$, where J and n are constants depending on the material. The damping energy above the cyclic stress sensitivity limit (CSSL) was dependent on the stress history, but stress history had no observable effect on damping below the CSSL. Values obtained for n below the CSSL varied between 2.0 and 2.6. Above the CSSL, the rate of change of damping with stress increased. The ratio of stress at the CSSL to fatigue strength varied from approximately 0.5 for the Mg alloy to 1.1 for the Sandvik steel in the quenched and tempered condition. Data are given on the relative damping properties. With the exception of gray iron, none of the materials exhibited an average dynamic modulus of elasticity lower than 95% of the static modulus at the respective fatigue strengths. A comparison of the relative damping properties for equal stress below the CSSL indicates that the damping energy de-

creases with an increase in the fatigue and tensile strengths of the materials. On the basis of equal ratio of stress to fatigue strength, the damping energies showed an increase with both fatigue and tensile strengths. A review of prior work is given.

Naval Civil Engineering Lab., Port Hueneme, Calif.
CORROSION SURVEY OF STEEL SHEET PILING, by C. V. Brouillette and A. E. Hanna. Final rept. 27 Dec 60, 66p. 21 refs. Technical rept. R-097.
Order from OTS $1.75 PB 171 501

A study was made of the corrosion of steel sheet piling in marine environments in order to improve the design and construction of future installations and to predict the life of existing structures. The effectiveness of cathodic protection was investigated. (Author)

Naval Engineering Experiment Station, Annapolis, Md.
INVESTIGATION OF THE MECHANICAL PROPERTIES AND SEA WATER CORROSION CHARACTERISTICS OF NODULAR (DUCTILE) CAST IRON, by M. R. Gross. [1952] 33p. 12 refs. E.E.S. rept. 4E(E1)101717.
Order from LC mi$3.00, ph$6.30 PB 154 809

This report released for sale to the public 16 Mar 61.

Based on the tensile property measurements and the shock tests described herein, it is concluded that fully annealed nodular iron is a suitable material for shipboard applications. Unfortunately, the low notch impact resistance of the material tested imposes an element of doubt as to the validity of this conclusion. In so far as the tensile tests are concerned, there is a significant variation in ductility between the outside and center of large annealed coupons and among various locations in the engine frame. The shock resistance of the engine frame tends to lessen the importance of this variation, however.

Westinghouse Electric Corp., Bloomfield, N. J.
DIFFUSION OF COBALT IN MOLYBDENUM, by E. S. Byron and V. F. Lambert. Rept. on Contract NOrd 10276. Jan 53, 25p. 7 refs. NAVORD rept. no. 3072.
Order from LC mi$2.70, ph$4.80 PB 154 542

This report released for sale to the public 2 Mar 61.

The diffusion coefficients for cobalt in molybdenum were determined at 900, 1100, 1275, 1500 and 1700°C. In the equation relating diffusion coefficient with temperature, $D = A \cdot e^{-Q/RT}$, the activation energy Q derived was 34,800 calories per mol, and the constant A was determined as $2.82 \times 10^{-6} cm^2/sec$. (Author)

Westinghouse Research Labs., Pittsburgh, Pa.
THE QUALITATIVE MECHANISM OF STRESS CORROSION CRACKING OF AUSTENITIC STAINLESS STEELS, by D. van Rooyen. Technical rept. no. 1 on Stress Corrosion Cracking, Contract Nonr-2868(00). 10 Nov 59, 52p. 20 refs. AD-236 225
Order from LC mi$3.60, ph$9.30 PB 150 502

Results support the electrochemical mechanism of stress corrosion crack initiation in austenitic stainless steel: after a period of initiation, during which partial passivation occurs, local anodes corrode along certain narrow planes, resulting in cracking and ultimate failure. Crack lengths gradually increase with time, after the onset of stress corrosion crack propagation, and no cracking occurs during the initiation stage. The cracks extend slowly through austenitic stainless steels and a mg-base alloy, without any steps of instantaneous advance. Crack propagation in mild steel, placed in hot nitrate solutions, takes place in alternating steps of rapid and slow penetration. The rapid steps are not instantaneous. The stress corrosion cracking of Al-4% Cu and Al-7% Mg alloys, in Na Cl-Na HCO_3 bicarbonate solutions, consists of alternating stages of electro-chemical corrosion and sudden physical failure. Study methods used include the automatic recording of electrochemical potential change and extension of specimens, and the acoustic recording of sound generated during cracking. Samples were tested as wires or strips; stressed in direct tension, or as U-bends or arc-bends. (Author)

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Bartol Research Foundation, Franklin Inst., Swarthmore, Pa.
ANNUAL REPORT NO. 7, by W. F. G. Swann and C. E. Mandeville. Rept. for 1 Oct 56-30 Sep 57 on Contract N6ori-144(01). 30 Sep 57, 58p. 100 refs.
Order from LC mi$3.60, ph$9.30 PB 150 696

Resonance fluorescence studies; Nuclear resonance fluorescence in As^{75}; The radiations of two Odd-A isotopes of osmium; The radiations of Os^{185}; The radiations of Co^{55}; The nature of the photosensitivity of Geiger counters; Cosmic Rays: balloon flights, shipboard neutron monitor, Thule neutron monitor, satellite, emulsion studies, Theoretical Studies.
Included in the report are:
Lifetimes of the 6.91 - and 7.12-mev excited states of O^{16}, pub. in The Physical Review 108:982-988, 15 Nov 57
Acceleration of particles to cosmic ray energies by electromagnetic induction, pub. in Jnl. of the Frank-
(Nuclear Physics--and Nuclear Chemistry,
lin Inst. 264:287-299, Oct 57
Search for a long-lived radioisotope of neodymium, pub. in Jnl. of the Franklin Inst. 263:553-556, June 57
Radiations from W^{185} and W^{187}, pub. in The Physical Review 106:785-790, 15 May 57
Gamma rays of As^{77}, pub. in Jnl. of the Franklin Inst. 263:351-354, Apr 57
Sea-going cosmic-ray observatory, pub. in Jnl. of the Franklin Inst. 263:153-159, Feb 57
Nuclear energy levels of Os^{188}, pub. in The Physical Review 104:722-727, 1 Nov 56.

Michigan U. Research Inst., Ann Arbor.
COSMIC RAY INVESTIGATIONS. Annual progress rept. on Contract Nonr-1224(07). 31 May 60, 8p. AD-238 168.
Order from LC mi$1.80, ph$1.80 PB 148 215

Contents:
Air shower experiment
Ionization chamber array
Cloud chamber
MIT 60-in. cloud chamber
Direct pair production by muons underground

Elementary Particles

California U., Berkeley.
SOME EFFECTS OF HOLE-HOLE INTERACTIONS IN SYSTEMS OF FERMIONS, by J. Sawicki. Rept. on Contract AF 49(638)327. [1960] 17p. 11 refs. AFOSR TN-60-893; AD-243 994.
Order from LC mi$2.40, ph$3.30 PB 153 032

A generalized reaction matrix of the Brueckner theory is discussed involving the effects of hole-hole interactions in large systems of fermions. Corrections to the real part of the single particle excitation energy are estimated for the cases of nuclear matter and liquid He^3. The problem of the damping factor (i.e., the imaginary energy shift) is discussed. (Author)

High-Energy Physics Lab., Stanford U., Calif.
EXPERIMENTAL STUDY OF THE MAGNETIC STRUCTURE OF THE NEUTRON, by J. I. Friedman, H. W. Kendall, and P. A. M. Gram, III. Rept. on Contract N6onr-251(16). 25 May 60, 28p. 30 refs. HEPL-199.
Order from LC mi$2.70, ph$4.80 PB 148 155

A measurement of the ratio of the magnetic form factor of the neutron to that of the proton has been carried out by comparing large- and small-angle elastic electron-deuteron scattering at constant four-momentum transfers. The experimental result for the average value of the ratio in the range of momentum transfers from 1.6 f^{-1} to 2.25 f^{-1} is $F_{1n}/F_p = (0.91 \pm 0.05) \pm 0.07$; the first error is a standard deviation from experimental uncertainties, and the second from theoretical uncertainties in the analysis. Measurements of the ratio of the nucleon isotopic scalar form factors have also been obtained from this experiment. The average value of F_2^S/F_1^S for the same range of momentum transfers has been found to be $(+0.06 \pm 0.09) \pm 0.13$. The small-angle scattering data have been used to determine the charge form factor of the deuteron in the range of momentum transfers from 0.98 f^{-1} to 2.8 f^{-1}. The results are consistent with a repulsive-core model of the deuteron. (Author)

Illinois U., Urbana.
BEAM ANALYZER MAGNET. PART I, by Van Bluemel and Santimay Chatterjee. Technical rept. no. 17 on Contract Nonr-1834(05). 11 May 60, 48p. 4 refs. AD-240 891.
Order from LC mi$3.30, ph$7.80 PB 149 315

The design and operation of the magnet used to analyze the energy of the particles accelerated by a spiral ridge cyclotron are described. The old 16-in.-diam cyclotron magnet is converted to a 30^o sector magnet by adding two wedge shaped pole pieces. The method employed to design the extra pole pieces is described. The pole pieces and the vacuum chamber connecting the beam tubes are so designed that a beam can be deflected to both sides of the central direction of the beam by changing the direction of the current flowing through the coils of the analyzer magnet. The magnetic fields on the beam entrance side and the beam exit side of the magnet have been extensively measured for various values of magnetic field at the center of the magnet. All data are presented. The automation control circuit used for regulating the current in the magnet is also described. (Author)

Institute of Theoretical Physics, Stanford U., Calif.
PRODUCTION OF PARTICLE BEAMS AT VERY HIGH ENERGIES, by S. D. Drell. Technical note no. 28 on Contract AF 49(638)388. Aug 60, 13p. 8 refs. AFOSR-TN-60-1136; AD-246 635.
Order from LC mi$2.40, ph$3.30 PB 153 188

The physical principle that a transition amplitude has a pole for real one-particle intermediate states is used to study the photoproduction of secondary beams of high energy strongly-interacting particles. Photons were found to be much more effective in initiating collimated beams of high energy charged pions, K mesons, etc., than believed; this result is of interest in predicting and comparing yields from electron linacs, electron synchrotrons, and proton synchrotrons in the multi-Bev range.

Washington U., St. Louis, Mo.
STUDY OF SYSTEM FOR PHOTOGRAPHY OF A LIQUID HELIUM BUBBLE CHAMBER, by Paul Aikin Smith, Master's thesis. Technical rept. no. 6 on Cosmic Rays, Contract Nonr-816(09). May 60, 62p. 41 refs. AD-240 073.
Order from LC mi$3.90, ph$10.80 PB 149 087

The theory, construction, and performance of a photographic system are described for use with a small liquid helium bubble chamber of one liter capacity. The contrast between bubble image and background fog on the photographic film as a function of the size of the bubble, and the ability to distinguish between adjacent bubbles in the chamber are discussed. A theoretical analysis of the angular dependence of the intensity of light scattered by helium bubbles of radii from one micron up is given, making use of 4 different computational procedures appropriate to the various portions of the size range. The theory of image intensity as a function of (1) depth of field, (2) magnification, and (3) lighting system design parameters is developed for the case of dark field photography of helium bubbles in liquid helium. An analysis is given of the comparative case of photographing (1) water drops falling through isopentane, and (2) helium bubbles in liquid helium. Experimental results of photography of water drops falling through isopentane are given. Results show that helium bubbles having radii smaller than 5μ will be difficult to photograph, while those having radii larger than 20μ will be rather easy to photograph.

Controls for Radiation, Inc., Cambridge, Mass.
DEVELOPMENT OF A TACTICAL GAMMA NEUTRON DOSIMETER, by I. A. Berstein, R. C. Fix and others. Bi-monthly progress rept. no. 1, 1 July-31 Aug 58, on Contract DA 18-108-405-cml-198. 1 Sep 58, 6p. AD-211 296.
Order from LC mi$1.80, ph$1.80 PB 154 428

This report released for sale to the public 8 Mar 61.

Design of equipment for automatically filling and sealing E-5 dosimeter ampoules was investigated. Ampoules were sealed using a Nichrome resistance loop; however, the seal was not entirely satisfactory. In addition, glo-bars, (silicon carbide heating elements) were investigated. The commercially available glo-bars are too large for ampoule sealing application, and it is thought that smaller designs would be too costly. A promising combination of glo-bars with Pt-Rh alloys is scheduled for testing.

Controls for Radiation, Inc., Cambridge, Mass.
DEVELOPMENT OF A TACTICAL GAMMA NEUTRON DOSIMETER, by I. A. Berstein, R. C. Fix and others. Bi-monthly progress rept. no. 2, 1 Sep-31 Oct 58, on Contract DA 18-108-405-cml-198. 1 Nov 58, 10p. AD-211 297.
Order from LC mi$1.80, ph$1.80 PB 154 429

This report released for sale to the public 8 Mar 61.

An 80% Pt - 20% Rh alloy was investigated for sealing E-5 dosimeter ampoules. Very favorable results were obtained. A number of sealing units consisting of Pt - Rh alloy imbedded in cement were constructed and studied. It was concluded that with minor modifications automatic filling and sealing equipment can be assembled and put into use. The use of RF induction heating was also investigated. Several ampoules were successfully sealed by this method, and further investigation is proposed. (See also PB 154 428)

Controls for Radiation, Inc., Cambridge, Mass.
DEVELOPMENT OF A TACTICAL GAMMA NEUTRON DOSIMETER, by I. A. Berstein, R. C. Fix and others. Bi-monthly progress rept. no. 3, 1 Nov-31 Dec 58, on Contract DA 18-108-405-cml-198. 5 Jan 59, 12p. AD-209 700.
Order from LC mi$2.40, ph$3.30 PB 154 430

This report released for sale to the public 8 Mar 61.

Assembling and testing of the various components and instruments used in the equipment for automatically filling and sealing E-5 dosimeter ampoules were studied. Brief descriptions applied to each component such as the oxygen analyzer, atmosphere gas control apparatus, pH measurement device, and water and trichlorethylene purifiers are given. In addition, phenol red purification is described, as well as water deaeration, a sealing unit temperature measuring system, and the operator equipment and instrument platform. (See also PB 154 429)

Naval Research Lab., Washington, D. C.
DOSIMETRY BY LUMINESCENCE DEGRADATION IN ORGANICS, by Frank H. Attix. Rept. for Dec 57-Oct 59 on The Chemistry and Physics of Materials, Contract AF MIPR (33-616)58-21. Oct 60, 66p. 25 refs. WADD Technical rept. 60-563.
Order from OTS $1.75 PB 171 491

This report covers an investigation of the phenomenon of photoluminescence degradation in organic materials due to damage by ionizing radiations. A survey of previous studies of this effect is presented. The present work stresses reduction to a practical dosimetry system for the $5x10^5$ to $5x10^9$ rad absorbed dose range. It is demonstrated that pressed wafers of anthracene and of p-quaterphenyl can be employed together to cover the required dose range. Ultraviolet light (3650 angstrom) is used to excite the photoluminescence, which is observed in a narrow band at 4420 angstrom. Some recovery of photoluminescence with time after X-ray irradiations is observed, and heat treatment is proposed as a method of reducing this effect. Degradation of luminescence in biphenyl, p-terphenyl, fluorene, naphthalene, and tetracene have also been studied and are reported upon. (Author)

Naval Research Lab., Washington, D. C.
A SOLID STATE BRAGG-GRAY CAVITY CHAMBER, by Victor H. Ritz and Frank H. Attix. Rept. for Mar 59-June 60 on The Chemistry and Physics of Materials, Contract AF MIPR (33-616)59-27. Oct 60, 24p. 11 refs. WADD Technical rept. 60-562.
Order from OTS $0.75 PB 171 490

An attempt has been made to construct the solid state analogue of a Bragg Gray cavity ionization chamber. Thin layers of materials sensitive to radiation have been placed between walls of C, Al, Cu, Sn or Pb. Two types of sensing agents have been employed; thin layers of anthracene whose ultraviolet induced luminescence degrades upon irradiation, and 6 micron thick polyethylene terephthalate (Mylar) films whose optical density at 3250A increases upon irradiation. Results in a Co^{60} γ-ray field with the anthracene disagree sharply with theory, while the Mylar film yields excellent agreement (±5%) with theory. A preliminary attempt to discriminate between the fast neutron and gamma ray dose in a nuclear reactor has been unsuccessful. (Author)

Radiation Research Corp., West Palm Beach, Fla.
DOSIMETER CHARGER (RADIOACTIVE), by M. J. Cohen. Quarterly rept. for 1 Apr-30 June 53 on Contract NObsr-63046. 2 July 53, 26p. 5 refs. AD-22 410.
Order from LC mi$2.70, ph$4.80 PB 154 753

This report released for sale to the public 15 Mar 61.

The Type D experimental dosimeter charger was selected as the basis for design of the ten developmental models. The layout of this model has been completed. Assembly of 10 units is about 40% completed. A report on "Power Supply Requirements for Neutron Counters" has been completed and is included. (Author)

Nuclear Reactions

High-Energy Physics Lab., Stanford U., Calif.
ELECTROPRODUCTION OF PIONS FROM HYDROGEN AND DEUTERIUM, by Gerald G. Ohlsen. Rept. on Contract N6onr-25116. 20 May 60, 34p. 14 refs. HEPL-203.
Order from LC mi$3.00, ph$6.30 PB 148 154

The absolute cross section for direct production of pions in electron-proton and electron-deuteron collisions has been measured by the detection of inelastically scattered electrons. Proton data has been taken throughout the range of $q^2 = 2.6\ f^{-2}$ to $q^2 = 10.75\ f^{-2}$, and center of mass energy E = 1100 Mev. to E = 1300 Mev. Data analysis has been in terms of neutron magnetic moment distribution. Comparison with available theory yields a neutron rms magnetic moment of 1 f, but better theoretical calculations may change this value somewhat. No theory for the electroproduction of pions from deuterons exists at present. The deuteron data is presented in terms of absolute cross sections as well as in terms of deuteron-proton cross section ratio. (Author)

Physics Research Lab., U. of Illinois, Urbana.
THE PHOTONEUTRON CROSS SECTION NEAR THRESHOLD, by P. Axel and J. D. Fox (Doctoral thesis). Technical rept. no. 13 on Contract Nonr-1834(05). Feb 60, 191p. 84 refs. AD-233 889.
Order from LC mi$8.70, ph$30.30 PB 153 140

The experimental and theoretical study of photoneutron cross sections near threshold is described. Photonuclear measurements are used to determine such nuclear properties as neutron binding energies, spins and parities of nuclear energy levels, relative widths of different decay modes of states formed by photon absorption, and electromagnetic transition probabilities. The source of the photons was the x-ray beam from a betatron yielding a photon spectrum produced by electrons of different energy due to multiple scattering. The theoretical predictions are evaluated for the photoneutron cross section in terms of the following parameters: (1) the photon absorption mechanism and the fractional strengths of the various modes (predominately E1, M1, and E2, but possibly higher modes); (2) the energy dependence of the cross section for each of these modes; (3) the spins and parities of the initial, intermediate, and final states; (4) particle binding energies; (5) competition parameters affecting the decay of the compound state, (including gamma ray, neutron, and proton partial widths); and (6) the energy dependence of the competition parameters.

Pittsburgh U., Pa.
DISTORTED WAVE METHOD FOR ELECTRON CAPTURE FROM ATOMIC HYDROGEN, by R. H. Bassel (Doctoral thesis) and E. Gerjuoy. Technical rept. no. 12 on Capture-Loss and Ionization Cross-Sections of Ions and Neutral Particles, Contract Nonr-624(06). Apr 60, 30p. 30 refs. AD-237 494.
Order from LC mi$2.70, ph$4.80 PB 147 543

The distorted-wave method, in which distorted waves replace plane waves in the matrix elements for the collision amplitude, is given a rigorous formulation for arbitrary rearrangement collisions. In atomic collisions involving electron rearrangement, the formulation enables removal of the unphysical internuclear Coulomb interaction from the "perturbation" Hamiltonian. The procedure is applied to the problem of electron capture by protons in atomic hydrogen, eliminating explicit dependence on the proton-proton interaction. Numerical results of a first-order calculation are in good agreement with experiments from 35 to 200 kev. Despite this agreement and the agreement of previous calculations it is felt the charge-transfer process is still not well understood. (Author)

Sarah Mellon Scaife Radiation Lab., U. of Pittsburgh, Pa.
STUDIES OF THE ANNIHILATION OF POSITRON IN GASES, by Milton Heinberg and Lorne A. Page. Final rept. for 1 Dec 55-30 Nov 56 on Research and Development on Study of Positronium and Magnetic Moment of the Electron, Contract DA 36-[061]-ORD-515. [1956] 69p. 16 refs. AD-128 532.
Order from LC mi$3.90, ph$10.80 PB 154 817

This report released for sale to the public 17 Mar 61.

The study of the process of positron annihilation by measurement of the angular correlation of the two quanta from the annihilation event has been used successfully in solids. No precision experiment on the angular correlation of the two quanta from the annihilation events in gases has been reported previously. In this work the distribution in angle is usually limited to within ten milliradians of 180° with particular attention to the effect of a d. c. magnetic and/or a d. c. electric field on the events within two milliradians of 180°. The pressures used were from one to 28 atmospheres. The experiments on the magnetic quenching of ortho-positronium done previously in various gases[7-9] have been extended to higher fields. The effects on the angular correlation and magnetic field dependence of argon by adding thermalizing and/or quenching gases has been studied. Some evidence of the n = 2 states of positronium has been found. (Author)

Washington U., Seattle.
AN EXPERIMENTAL STUDY OF CLOSE COLLISIONS OF HIGH ENERGY MU-MESONS WITH ELECTRONS, by Robert Francis Deery. Doctoral thesis. Technical rept. on Contract Nonr-477(12). Apr 60, 100p. 32 refs. AD-236 262.
Order from LC mi$5.40, ph$15.30 PB 147 306

Particles from cosmic-rays were required to pass through 14 in. lead above and 10 in. lead below the apparatus. Knock-on electron events originating in a target above the top section of a three section 36 in. cloud chamber operating in a field of 11,000 gauss were detected with the aid of two proportional counters which sandwich the top section. Electrons and mu mesons were identified by their behavior in traversing lead plates above and below the middle section. The target was 23.1 g/cm^2 of carbon in one experiment and 17.0 g/cm^2 of paraffin in the other. Energies of the electrons and muons were determined from track curvature measurements, and events accepted only

when the electron energy was greater than 100 Mev and the mu energy was from 5 to 50 Bev. The distribution of electron energies was compared with theoretical predictions based on quantum electrodynamics modified by a one parameter form factor and corrected for energy loss of the electrons before reaching the chamber. The data taken at face value would suggest an excess of events with large momentum transfers (50-100 Mev). The uncertainties inherent in this experiment and poor statistics prevent ascribing too much significance to this excess. (Author)

Radioactivity

General Electric Research Lab., Schenectady, N. Y.
ELECTRON INDUCED RADIATION DAMAGE IN PURE METALS, by R. M. Walker. Scientific rept. no. 3 on Contract AF 19(604)5557. Dec 60, 43p. 33 refs. AFCRL-TN-60-1122.
Order from OTS $1.25 PB 171 523

Electron bombardment of metals at low temperatures provides a quantitative treatment of both production and recovery processes: General features of electron irradiation of solids; Low-temperature electron bombardment of high-purity copper; Recent work on the influence of lattice imperfections on the damage and recovery processes; New results in Al, Ag, Au, Ni, and Fe; current outstanding problems. (See also PB 144 199)

High-Energy Physics Lab., Stanford U., Calif.
ELECTRODISINTEGRATION OF Ta AND Au NUCLEI, by W. C. Barber and T. Wiedling. Rept. on Contract N6onr-25116. 26 Apr 60, 25p. 17 refs. Rept. no. HEPL-192.
Order from LC mi$2.70, ph$4.80 PB 147 553

Yield curves were measured for the production of 5.6-day Au^{196} and 30-second Au^{195} from Au^{197}, and of 8.1-hour Ta^{180}, 2.1-hour Ta^{178}, and 9.3-min Ta^{178} from Ta^{181}, in foil stacks which were bombarded by electrons. The results were analyzed to compare the yields resulting from the direct effect of the electrons with those resulting from bremsstrahlung from the electrons. The comparison shows the direct effect is relatively larger than is predicted by existing theories of electrodisintegration if the transitions being excited are entirely electric dipole. (Author)

Princeton U., N. J.
STUDIES OF NATURAL AND INDUCED RADIOACTIVITIES, by James R. Arnold. Final rept. on Contract DA 36-034-ORD-2163. 1 June 59, 90p. 62 refs. OOR rept. no. 1574:5; AD-225 038.
Order from LC mi$4.80, ph$13.80 PB 154 417

Contents:
Sedimentary geochemistry of the beryllium isotopes
Methods for separation and determination of beryllium in sediments and natural waters
"Solar radioactivity" studies

Rome Air Development Center, Griffiss AFB, N. Y.
GENERATION AND DETECTION OF PULSED X-RAY FROM MICROWAVE SOURCES, by Anthony P. DeMinco. Nov 60, 17p. 9 refs. RADC-TR-60-185.
Order from LC mi$2.40, ph$3.30 PB 153 858

In his quest for higher and higher output power from his microwave generators, man has within twenty years come from average outputs of ten watts to present outputs of almost one million watts. In addition to the consideration of microwave radiation hazards with increased power, X-radiation, another potential hazard has become evident. In order to produce increased powers, bigger and better high power tubes are required, which calls for an increase in plate voltages and plate currents, the necessary ingredients for more efficient penetration and higher ionizing intensities. Until recently, the X-radiation intensities from Air Force electronic equipment were not considered as serious potential hazards as the r-f or microwave radiation. This paper describes in general the generation and detection of pulsed X-radiation emanating from high power microwave generators. (Author)

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

Columbia U., New York.
REPLACEMENT OF PERIODICALLY INSPECTED EQUIPMENT (AN OPTIMAL OPTIONAL STOPPING RULE), by C. Derman and J. Sacks. Technical rept. no. 8 on Contract Nonr-266(55). Feb 60, 21p. 6 refs. AD-233 902.
Order from LC mi$2.70, ph$4.80 PB 153 149

The following modified problem which involves the efficient use of acquired information is considered: Suppose the equipment is such that it has a measurable characteristic associated with it which is decreasing in time; i.e., the equipment deteriorates. Assume that at times $t = 1, 2, \ldots$, the amount of deterioration $X(t)$ occurring during the interval $(t-1, t)$ is observable and that the sequence $\{X(t)\}$ $t = 1, 2, \ldots$ is a sequence of independent, identically distributed, nonnegative random variables with common distribution function F. The equipment is known to fail if $\sum X(t) > L$ (a given constant for $t = 1, 2, \ldots, n$. Hence Z, the service life, satisfies the inequalities $k-1 < Z \leq k$. (Author).

RCA Defense Electronic Products, Camden, N. J.
IMPROVED EARCUSHIONS FOR FLYING HELMET, by Leo Weinreb. Rept. for Apr 57-Dec 59 on Contract AF 33(616)5248. Oct 60, 31p. 6 refs. WADD Technical rept. 60-568.
Order from OTS $1.00 PB 171 493

An improved earcushion has been developed for use in flying helmets. This earcushion is superior in comfort, fit, durability and acoustical properties to any prior earcushions used in a similar application. It employs a special drawback provision which appreciably aids the user in donning and removing the helmet and which permits him to relieve headband pressure when in low noise. The earcushion assemblies are provided in kit form with mounting instructions for use with the MA-3 high altitude helmet. However, with minor modification they can be adapted to other helmets. This report presents the background and theory underlying the approach to the development and design of this earcushion. Mounting techniques and earcushion materials and their influence on acoustical performance, comfort, fit, durability and helmet integration are discussed. Psychoacoustic testing and the calculation of articulation index are described and related test data are presented. (Author)

Science and Tech. Div., Library of Congress, Washington, D. C.
UNDERWATER SWIMMING. Bulletin nos. 1-12 on Contract NAonr-33-57. May 57-Mar 60, 230p. 630 refs.
Order from OTS $3.00 PB 171 577

A bibliography.

PHYSICS

Air Force Special Weapons Center, Kirtland, AFB, N. Mex.
X-RAY MASS ATTENUATION COEFFICIENTS IN THE 1.49 TO 11.9 KEV RANGE, by C. E. Ehrenfried and D. E. Dodds. Jan 60, 62p. 17 refs. AFSWC-TN-59-33; AD-237 572.
Order from OTS $1.75 PB 171 527

Mass attenuation coefficients of eleven metals and three plastics were determined for fourteen X-ray energies from 1.49 to 11.92 kev. The sources of radiation were K emission from suitable fluorescers. The attenuation coefficients obtained for metals agree reasonably well with the compilation of Allen. The values for the plastics agree within 5 percent of calculated coefficients from Victoreen's data. Tables and graphs are given which show mass attenuation coefficients determined as well as values determined by several other investigators. (Author)

Avco Corp., Wilmington, Mass.
SCATTERING COEFFICIENTS FOR ABSORBING AND NONABSORBING AEROSOLS, by R. Penndorf. Scientific rept. no. 3 on Research on Aerosol Scattering in the Infrared, Contract AF 19(604)5743. Oct 60, 88p. 18 refs. RAD-TR-60-27; AFCRL-TN-60-667.
Order from LC mi$4.80, ph$13.80 PB 153 450

Applied problems involving light scattering by aerosols demand reliable numerical data of the scattering and absorption coefficients. When the size of the aerosol is smaller than the wavelength of the incident light, approximation formulas can be derived from the Mie theory. The asymptotic expansion of the exact solution is given, where the leading term is identical with the Rayleigh approximation. For the first time, the first three terms as function of the size parameter a are correctly derived for nonabsorbing, absorbing, and metallic spherical particles. Next, the error of the approximation is determined using one, two, and three terms. This approximation extends the useful size range by about a factor 2 for nonabsorbing aerosols. The new approximation allows for computing the scattering and absorption coefficients for small aerosols simpler and faster than the Mie formula. Numerical results are given for nonabsorbing aerosols having refractive indices between n = 1 and n = 2. For absorbing spheres, the numerical values are given for the coefficients in the appropriate formulas. (Author)

Naval Ordnance Lab., White Oak, Md.
THE MONTE CARLO METHOD: NEUTRON REFLECTION BY WATER, by Paul B. Morgan. 29 Jan 59, 60p. 37 refs. NAVORD rept. 6227; AD-220 676.
Order from LC mi$3.60, ph$9.30 PB 154 812

This report released for sale to the public 16 Mar 61.

The Monte Carlo Method with applications of interest to the physicist is discussed. Papers are listed which: (1) utilize the technique in the solution of physics problems, and (2) describe methods of increasing the efficiency of the technique. Comments are made on the general usefulness of the technique, its limitations and pitfalls. The treatment is introductory rather than comprehensive. The Monte Carlo Method is applied to the problem of estimating the probability of normally impinging monochromatic neutrons scattering back from deep circulating pure water. (Author)

Texas U., Austin.
RELAXATION PROCESSES IN LIQUIDS AND SOLIDS, by A. W. Nolle. Final rept. on Contract Nonr-375(05). 1 Apr 60, 44p. 14 refs. AD-237 244.
Order from LC mi$3.30, ph$7.80 PB 147 848

The experimental work consisted mainly of investigations of magnetic resonance relaxation, with a slightly smaller quantity of work on relaxation processes in ultrasonic-wave absorption. The results led to information concerning thermally activated molecular processes in high polymers, in molecular liquids, in aqueous solutions with paramagnetic ions, and in crystalline solids. (Author)

Acoustics

California U., Los Angeles.
FLUID MOTION AND SOUND, by Alan Powell. Annual summary rept. 1 May 59-30 Apr 60, on Contract Nonr-233(62). May 60, 6p. Dept. of Engineering rept. no. 60-51; AD-239 941.
Order from LC mi$1.80, ph$1.80 PB 149 089

Summaries of papers on the following topics are reported: Instability of Jets; Edge Tones; Aeolian Tones; Turbulent Jet Noise; Boundary Layer Noise; and Propagation Problems.

Psycho-Acoustic Lab., Harvard U., Cambridge, Mass.
PERIODIC STATUS REPORT 35. Rept. for 16 Nov 59-15 May 60 on Contract Nonr-1866(15) and National Science Foundation Grant G-2668. 15 May 60, 21p. 94 refs. PNM-87; AD-237 634.
Order from LC mi$2.70, ph$4.80 PB 147 765

Contents:
Auditory facilitation following stimulation at low intensities
On the new psychophysics
Ratio scales, partition scales, and confusion scales
The influence of inhibition on the sensation pattern of the skin and the eye
The speaker's subjective scale of vocal effort
The binaural summation of loudness

Electricity and Magnetism

Avco Corp., Wilmington, Mass.
AN EXPERIMENTAL INVESTIGATION OF NEGATIVE POINT-PLANE CORONA AND ITS RELATION TO BALL LIGHTNING, by Edward T. Pierce, Richard M. Nadile and Philip J. McKinnon. Final rept. on Contract AF 19(604)7342. 24 Oct 60, 80p. 41 refs. Technical rept. RAD-TR-60-29; AFCRL-TR-60-354.
Order from LC mi$4.50, ph$12.30 PB 153 916

Existing theories of ball lightning are briefly discussed. Kapitsa has suggested that the energy to sustain a fireball comes from resonant absorption of radio waves of 300/mc/s. Pierce has extended Kapitsa's theory by suggesting a mechanism for producing this r-f energy during a corona discharge. The corona discharge from a negative point flows in a series of regular pulses called trichel pulses. Based on the theoretical relationship between corona discharge (Trichel pulses) and ball lightning, an experimental program is developed. The main part of this report is concerned with the description and discussion of the experiments. To obtain the maximum possible corona frequencies, a van de Graaff generator has been utilized. An applied voltage of 280,000 volts has produced a current of 125 microamperes and a Trichel pulse frequency above 2 mc/s. This short experiment has established the usefulness of this type of generator. The experiment, however, has been conducted with a small d-c high-voltage generator (up to 30 kv). Pulse-repetition frequencies of a few mc/s have been the highest attained in the course of the experiments. The results obtained are then discussed as they concern ball lightning. (Author)

Lincoln Lab., Mass. Inst. of Tech., Lexington.
EXCITATION AND BOUNDARY EFFECTS IN SPIN WAVE RESONANCE, by R. F. Soohoo. Rept. on Contract AF 19(604)7400. 7 Dec 60, 8p. 6 refs. 53G-0045, AD-248 365.
Order from LC mi$1.80, ph$1.80 PB 153 700

Using the general spin wave dispersion relation and the general exchange boundary condition, the spin wave absorption spectrum in a Permalloy film is calculated. Whereas the spacings between the various spin wave resonance peaks are largely dependent upon the value of the exchange constant A, the result of the calculation shows that the relative intensities of the absorption peaks are dependent upon both A and the surface anisotropy energy density K_s. Thus, the value of K_s can be obtained by comparing the relative experimental intensities of the various peaks with the calculated results using various values of assumed K_s. Though the resonance intensities are also dependent upon the ratio of the r.f. magnetic fields at the two surfaces of the film, an experimental configuration may be devised such that the ratio of the two fields is near unity. In this way, K_s for permalloy films was estimated to be from 1 to 3 ergs/cm^2. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
MAGNETORESISTANCE AND DOMAIN STRUCTURE IN THIN FERROMAGNETIC FILMS, by Richard L. Coren (Doctoral thesis) and Hellmut J. Juretschke. Technical rept. no. 9 on Contract Nonr-839(06). 15 May 60, 126p. 23 refs. AD-238 086.
Order from LC mi$6.30, ph$19.80 PB 148 349

Magnetoresistance measurements were used to determine the magnetic domain structure of nickel films. The magnetoresistance results are discussed in terms of a new representation in which the resistivity components, parallel and transverse to the current, measured simultaneously as the applied magnetic field varies in magnitude or direction, are regarded as Cartesian coordinates. This representation is independent of the direction of the current relative to any preferred orientations in the film. Marked differences are found between the measured magnetoresistance and the behavior expected of a single domain film. The nature of the differences indicates that these films must at least contain a distribution of uniaxial magnetic regions in the film plane. A particular model having these properties is developed. (Author)

Electronics

Advanced Kinetics, Inc. [Santa Ana, Calif.]
PRODUCTION OF MILLIMETER AND SUB-MILLIMETER ELECTROMAGNETIC WAVES BY THE INTERACTION OF PLASMA AND ELECTRON BEAMS WITH HIGH INTENSITY PULSED MAGNETS, by Ralph W. Waniek. Scientific rept. no. 1 (Quarterly) 15 July-Oct 60, on Contract AF 19(604)7406. [1960] 7p. AFCRL-TN-60-1124; AD-248 330.
Order from LC mi$1.80, ph$1.80 PB 153 732

Theoretical studies have been initiated on the production of bremsstrahlung radiation by electron beams injected into high-field magnets. The first phase of the experimental work is aimed at testing the feasibility of injecting electron beams into high-field magnets.

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATIONS OF RARE-EARTH OXIDE CATHODES, by J. B. Baker and G. B. Gaines. Scientific rept. no. 5, 1 Aug-31 Oct 60 on Contract AF 19(604)5691. 1 Nov 60, 11p. 1 ref. AFCRL TN-60-1152. AD-248 616.
Order from LC mi$2.40, ph$3.30 PB 153 823

The emission properties of a mixture of the oxides of neodymium and gadolinium coated on a tantalum wire were determined. The emission level at 1400°C was as high as 0.5 amp/cm^2 but, in common with cathodes composed of the same coating on other refractory-metal base wires, the emission tended to be unstable at brightness temperatures of about 1300°C and below. (Author) (See also PB 152 538)

Boston Coll., Chestnut Hill, Mass.
RESEARCH DIRECTED TOWARD THE STUDY OF THE PROPERTIES OF A PLASMA THAT MAY LEAD TO A NEW TYPE OF EM GENERATOR, by William G. Guindon. Final rept. on Contract AF 19(604)2195. 19 Sep 60, 14p. 3 refs. AFCRL TR-60-429. AD-248 587.
Order from LC mi$2.40, ph$3.30 PB 153 820

A description is given of the major pieces of perma nent equipment constructed or assembled during the course of the work, mainly consisting of a 36-kilojoule capacitor bank and related apparatus. A summary description is given of the chief experiments carried out: (1) observation of the motion of ionized gas through a pulsed magnetic field; (2) pulsed Zeeman and Paschen-Back Effect measurements; and (3) work toward the development of a pulsed air-core betatron. (Author)

[Electronic Systems] Lab., Mass. Inst. of Tech., Cambridge.
MODULATION AND DEMODULATION WITH SEMICONDUCTORS, by Dale P. Masher. Technical rept. no. 2 on Contract N5ori-07876. 15 June 53, 59p. 9 refs. AD-16 811.
Order from LC mi$3.60, ph$9.30 PB 154 843

This report released for sale to the public 17 Mar 61.

Initial investigation of modulation and demodulation systems which employ transistors was concerned with classifying such systems in a manner which permits logical study and analysis. This work led to a classification system which considered linear, time-varying systems as first order, and nonlinear, square-law systems as second order. Further distinction was made between continuous-data systems in which the sensitivity function exhibits only discrete zero crossings, and sampled-data systems in which the sensitivity function possesses some characteristic distribution of finite intervals where the function is zero. Analyses were made of first- and second-order systems. The use of transistors as controlled-sensitivity devices was discussed for grounded-base and -emitter operation. Results derived experimentally from carrier-present and -suppressed systems which utilize transistors as time-varying parameters indicated that the transistor systems exhibit limited frequency response because of the intrinsic nature of the transistors, and that transistors offer no decided advantages over vacuum tubes with respect to linearity and distortion-free operation but are better than diodes in almost every operational aspect.

General Mills, Inc., Minneapolis, Minn.
STUDY OF SPUTTERING OF MATERIALS, by G. K. Wehner, N. Laegreid, and R. V. Stuart. Final rept. for 15 Apr 59-14 Oct 60 on Contract AF 19(604)5536. Oct 60, 75p. 40 refs. Rept. no. 2133; AFCRL-TR-60-418; AD-248 045.
Order from OTS $2.00 PB 171 513

Sputtering yield measurements for nitrogen, hydrogen and neon ion bombardment at energies up to 1 kev are presented. The hydrogen and nitrogen results are questionable. The neon yield results for 28 metals and semiconductors show that an important parameter in sputtering is the degree of filling of the d-shells of the target atoms. Yield measurement at very low bombarding ion energy are discussed. A new spectroscopic method allows the instantaneous measurement of sputtering yields down to 10^{-5} atoms/ion. It was found that yields at 10 ev bombarding energy become so small that erosion effects at a satellite surface should never pose any problems. Sputtering effects on the moon's surface are discussed. About 40 meters of material should have been sputtered in 10^9 years under solar wind bombardment. Sputtering provides an explanation for the smoothness of the lunar surface on a 10 cm scale.

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A SIMPLE APPROXIMATE EXPRESSION FOR CONVERTING DIRECTLY FROM NOISE FIGURES IN DB TO NOISE TEMPERATURES, by E. P. McCurley and C. Blake. Rept. on Contract AF 19(604)7400. 8 Dec 60, 5p. 46 G-0009, AD-248 912.
Order from LC mi$1.80, ph$1.80 PB 153 804

Sindel S. p. A., Rome (Italy).
MICROWAVE DETERMINATION OF AFTERGLOW TEMPERATURES AND ELECTRON COLLISION FREQUENCIES IN NITROGEN, by D. Formato and A. Gilardini. Technical summary rept. no. 1, Sep 59-Apr 60, on Contract AF 61(052)39. 30 Apr 60, 18p. 6 refs. AFCRL-TN-60-1136; AD-248 685.
Order from LC mi$2.40, ph$3.30 PB 153 807

Two hypothesis, ionization from metastables and shock waves, were proposed in order to explain the high electron temperature in the afterglow of a d.c. Nitrogen discharge. Some experiments have been performed to sustain or reject these hypothesis. The electron fractional energy loss per collision has also been measured and found in good agreement with previous measurements by Crompton and Sutton. (Author)

Stanford Electronics Labs., Stanford U., Calif.
DENSITY FLUCTUATIONS IN A PLASMA IN A MAGNETIC FIELD, WITH APPLICATIONS TO THE IONOSPHERE, by T. Hagfors. Scientific rept. no. 1 on Contract AF 19(604)7436. 5 Dec 60, 35p. 19 refs. AFCRL-TN-60-1164, AD-248 447.
Order from LC mi$3.00, ph$6.30 PB 153 824

General expressions are developed for the fluctuation in density of electrons, ions, and charge in a plasma in thermal equilibrium in an external magnetic field taking only Coulomb interaction into account. The spectral distribution of the spatial Fourier components of these fluctuations is derived from basic principles. The fluctuations in electron density are discussed in some detail, and spectra are computed under conditions which are thought to prevail in the outer ionosphere. Frequency spectra of general validity are computed for electron density fluctuations along the magnetic field. It is shown by means of examples that the frequency spectra under ionospheric conditions are not much influenced by the magnetic field except for density fluctuations fairly close to perpendicularity to the magnetic field. Applications to incoherent backscattering are discussed, and it is shown that, under suitable conditions, backscatter techniques can give valuable information about electron density, temperature and constituents of the ionosphere. (Author)

Stanford Electronics Labs., Stanford U., Calif.
THE EFFECTS OF INITIAL ELECTRON VELOCITIES AND SPACE CHARGE IN SECONDARY EMISSION, by M. D. Hare. Rept. on Contract AF 33(616)6207. 31 Dec 59, 32p. 12 refs. Technical rept. no. 303-2; AD-232 288.
Order from LC mi$3.00, ph$6.30 PB 150 717

Secondary-emission devices fall into two classes. (1) Those in which the emitter-collector potential is such that all emitted secondary electrons are received by the collector. (2) Those in which the emitter-collector potential is such that the number of collected secondary electrons equals the number of incident primary electrons. For either class of device this potential is determined by the nature of the secondary emitter, the electrode configuration, and the primary-electron current density. For the first class the collector must always be positive with respect to the emitter. For the second class there are cases in which this potential will be negative and others in which it will be positive. This paper shows how Langmuir's treatment of thermionic emission in the plane diode can be applied to secondary emission between parallel planes to compute the emitter-collector potential for either class of device. This treatment accounts for space charge and initial electron velocities. The effects predicted theoretically are supported by experimental measurements. (Author)

Molecular Physics and Spectroscopy

Carnegie Inst. of Tech., Pittsburgh, Pa.
INVESTIGATION OF THE REFLECTION AND SCATTERING OF MOLECULES BY SOLID SURFACES, by Paul M. Marcus. Final rept. on Contract Nonr-760(11), continuation of Contract N7onr-303. 8 Apr 60, 19p. 10 refs. AD-235 795.
Order from LC mi$2.40, ph$3.30 PB 153 768

Colorado U., Boulder.
ASPECTS OF MOLECULAR STRUCTURE OF ETHYL ALCOHOL AND THE DESIGN, CONSTRUCTION, AND OPERATION OF A STARK MODULATED MICROWAVE SPECTROGRAPH, by George Edward Schafer, Master's thesis. Technical rept. no. 7, pt. 1, 1 Feb 53-30 Sep 59, on Study of the Wave Equation for Loosely Coupled Molecules, Contract DA 23-072-ORD-1059. [1959] 169p. 32 refs. OOR rept. 839.10-P; AD-228 615.
Order from LC mi$7.80, ph$25.80 PB 150 701

A Stark modulated microwave spectrograph was designed, constructed, and tested. A set of instructions were prepared to facilitate the use, maintenance, and repair of the components of the spectrograph. This instrument was used to examine ethyl alcohol for Stark sensitive absorption lines in the frequency range of 12.4 to 26.5 kMc/s. The frequency range of 18.0 to 26.0 kMc/s was systematically searched at relatively high sensitivity, while the remainder of the frequency range was examined for relatively intense absorptions. A number of absorption lines had Stark components which could be resolved, and the rotational transitions of these lines were tentatively identified. These absorptions were then examined again, and a tentative analysis of the spectrum was made. From this analysis, the following provisional molecular constants were determined for ethyl alcohol; A = 33,326.64 Mc/s, B = 9112.85 Mc/s, C = 8019.38 Mc/s, K = 0.913576, μ_a = 1.18D, and μ_b = 1.37D, where A, B, and C are the rotational constants associated with the least, intermediate, and greatest moments of inertia, respectively, μ_a and μ_b are the components of the dipole moment along the axes of the least and intermediate moments of inertia, respectively, and K is Ray's asymmetry parameter. (Author)

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena, Calif.
EQUILIBRIUM EMISSIVITY CALCULATIONS FOR A HYDROGEN PLASMA AT TEMPERATURES UP TO 10,000°K, by D. Olfe. Technical rept. no. 33 on Contract Nonr-220(03) and AF 18(603)2. May 60, 69p. 53 refs.
Order from LC mi$3.90, ph$10.80 PB 148 936

The important equilibrium emission processes in a hydrogen plasma have been investigated in the temperature range between 300°K and 10,000°K for pressures up to several hundred atmospheres. Representative emissivity calculations have been carried out for a transparent gas at a total pressure of 100 atmos and a mean beam length of 30 cm. Important emissivity contributions were made by the pressure-induced fundamental vibration-rotation band and rotational lines of H_2 at the lower temperatures, i.e., below approximately 4500°K. Above this temperature, the bound-free and free-free transitions of the H^- ion and the continuum and line radiation of the H atom are the most important contributors to the emissivity. The following emission processes were also investigated; the bound-free transitions of the H_2^+ ion, free-free transitions of colliding H atoms and H^+ ions, electronic transitions of the H_2 molecule, quadrupole vibration-rotation transitions of the H_2 molecule, and vibration-rotation transitions of the HD molecule. In addition, the effects of the lowering of the ionization

potentials by the fields of plasma ions and of the very broad wings of the Lyman a line have been considered. (Author)

Harvard U., Cambridge, Mass.
SECOND DIFFERENCES OF MOMENTS OF INERTIA IN STRUCTURAL CALCULATIONS: APPLICATION TO METHYL-FLUOROSILANE MOLECULES, by Lawrence C. Krisher and Louis Pierce (U. of Notre Dame). Rept. on Contract Nonr-1866(14). [1960] 26p. 12 refs. AD-231 434.
Order from LC mi$2.70, ph$4.80 PB 153 154

An extension and application of the method recently proposed by Pierce [J. Mol. Spectroscopy 3:575, 1959] for the location of "near-axis atoms" from spectroscopically determined moments of inertia is made. Equations are derived which are required for the application of the method to asymmetric top molecules with C_s symmetry. The method is applied to the determination of silicon coordinates in the molecules CH_3SiH_2F and CH_3SiHF_2. The experimental results are combined with results of previous microwave investigations of these molecules in order to determine their structures. Addition of each fluorine atom lowers the SiC distance. The SiF distance is lowered on adding the second fluorine. In the case of CH_3SiHF_2 the equilibrium conformation (staggered) is also determined. (Author)

Lyman Lab. of Physics, Harvard U., Cambridge, Mass.
ATOMIC BEAM RESONANCE EXPERIMENTS WITH STORED ATOMS, by Mark Goldenberg. Final rept. for 15 Jan 58-14 Jan 60 on Contract DA 36-039-sc-74976. 23 July 60, 73p. 22 refs. AD-243 052.
Order from LC mi$4.50, ph$12.30 PB 153 237

The atomic beam separated oscillatory field resonance technique was used to study the hyperfine frequency of cesium as perturbed by collisions with storage box walls. With a wall coating of long straight-chain saturated hydrocarbons, resonances are observed even with approximately 200 wall collisions. A theory based on the statistical nature of the collision interaction is described which is in qualitative agreement with the experimental data on the frequency shifts and line broadening. (Author)

Mallinckrodt Chemical Lab., Harvard U., Cambridge, Mass.
SUPPLEMENTARY FORMULA INDEX FOR MICROWAVE SPECTROSCOPY FOR 1954-1958, by E. Bright Wilson, Jr. and James R. Holton. Rept. on Contract Nonr 1866, Task order XIV. [1960] 19p. 346 refs. AD-234 157.
Order from LC mi$2.40, ph$3.30 PB 154 113

Materials Research Lab., Watertown Arsenal, Mass.
COMMENTS ON DETERMINATION OF ATOMIC SCATTERING FACTORS, by D. R. Chipman and A. Paskin. July 60, 5p. 1 ref. MRL rept. no. 88.
Order from LC mi$1.80, ph$1.80 PB 150 088

Errors in a recent article by R. B. Roof, Jr. are pointed out. A possible explanation is given for the fact that Roof's final result is nearly correct. (Author)

Noyes Chemical Lab., U. of Illinois, Urbana.
ELECTRON COUPLING OF NUCLEAR SPINS. IV. TEMPERATURE DEPENDENCE IN SUBSTITUTED ETHANES, by John C. Schug, Paul E. McMahon, and H. S. Gutowsky. Technical rept. no. 28 on Contract Nonr-1834(13). 1 Apr 60, 28p. 16 refs. AD-237 051.
Order from LC mi$2.70, ph$4.80 PB 147 775

The proton-proton coupling constant, $A_{HH'}$, in H-C-C'-H' groups is known to depend upon the dihedral angle, ϕ. Previous valence-bond calculations by Karplus (J. Chem. Phys. 30:11, 1959) have given the result that $A_{HH'} \cong A_o \cos^2 \Phi + B$. This relation is used to estimate the effects upon the average coupling constant of torsional vibrations and reorientations about the C-C' bond. For substituted ethanes, it is found that torsional vibrations produce a modest temperature dependence, of opposite sign for the trans and gauche coupling. However, for molecules in which the potential function, $V(\phi)$, has 3-fold symmetry, rotational averaging leads to a cancellation of the vibrational effects, giving a temperature independent value, $\langle A_{HH'} \rangle$, for the average coupling. This prediction was verified in experiments on ethyl nitrate for which $\langle A_{HH'} \rangle$ was found to have a constant value of 6.92 cps over a 100° temperature range.

Western Ontario U. (Canada).
TRANSITION PROBABILITIES OF MOLECULAR BAND SYSTEMS. XVII: TABULATED KLEIN-DUNHAM POTENTIAL ENERGY FUNCTIONS FOR FIFTEEN STATES OF N_2, N_2^+, NO, O_2, C_2 AND OH, by W. R. Jarmain. Scientific rept. no. 5 on Contract AF 19(604)4560; Scientific rept. no. 2 on Contracts AF 49(638)640 and Nonr-2895(00). 1 July 60, 20p. 7 refs. GRD-TN-60-498; AFOSR-TN-60-877; AD-247 906.
Order from LC mi$2.40, ph$3.30 PB 153 637

Sets of classical turning points, together with the corresponding vibrational energies, are given for the following molecular states: N_2, $X^1\Sigma_g^+$, $a^1\Pi_g$, $A^3\Sigma_u^+$, $B^3\Pi_g$, $C^3\Pi_u$; N_2^+, $A^2\Pi$; NO, $A^2\Sigma^+$, $B^2\Pi_r$; O_2, $a^1\Delta_g$, $b^1\Sigma_g^+$; C_2, $X^3\Pi_u$, $a^1\Sigma_g^+$, $b^1\Pi_u$, $d^1\Sigma_u^+$; OH, $X^2\Pi_i$. These numbers, which were calculated from series formulae, represent Klein-Dunham potential energy functions for the states listed. The maximum vibrational quantum number varies from 2 to 14, depending on avialable experimental data. (Author)

Optics

Massachusetts U., Amherst.
THE SCATTERING OF LIGHT BY POLYMER FILMS POSSESSING CORRELATED ORIENTATION FLUCTUATIONS. I, by Richard S. Stein and Philip R. Wilson. ONR Technical rept. no. 18 on Contract Nonr-2151(00). 10 May 60, 24p. 9 refs. AD-244 444.
Order from LC mi$2.70, ph$4.80 PB 150 657

The scattering of light from polymer films exhibiting random and anisotropic orientation fluctuations is analyzed mathematically. The equations derived are related to those of Prins (Physica 22:576, 1956; ibid 23:253, 1957) and Peterlin (Physik. Z. 37:43, 1936) who studied orientation fluctuations principally as related to the depolarization of low molecular weight liquids. In the analysis of anisotropic orientation fluctuations, different types of orientation are discussed; including (1) ideal fiber-like orientation where the principal axes are always orientated along the line of separation, and (2) ideal disklike orientation where the principal axes are oriented perpendicular to the line of separation. Actual systems cannot exhibit either extreme but may deviate from randomness in a rod or disklike manner. The type of anisotropy is dependent on the crystallization mechanism.

Naval Ordnance Test Station [China Lake] Calif.
THE DESIGN OF A VERSATILE LOW-POWER PERISCOPE, by Theodore R. Whitney, Roger S. Estey, and Lawrence W. Nichols. 20 Mar 50, 10p. NAVORD rept. 1222; NOTS 279.
Order from LC mi$1.80, ph$1.80 PB 154 750

This report released for sale to the public 15 Mar 61.

A periscope is described which permits an operator to view remote-controlled operations from a position behind protective barriers. Line of sight from the objective can be directed through 180 degrees horizontally and 75 degrees vertically by the operator. The optical system and mechanical components are of a configuration that permits the periscope to conform to many contours differing both in length of path and location of corners. Optical resolution is good enough to allow the reading of dial instruments in the object plane. (Author)

Wayne State U., Detroit, Mich.
EXPERIMENTAL INVESTIGATIONS ON THE LIGHT SCATTERING OF COLLOIDAL SPHERES. IV. SCATTERING OF LINEARLY POLARIZED LIGHT AND THE "SCATTERING RATIO" AT AN ANGLE OF OBSERVATION OF 90°, by Wilfried Heller and Richard Tabibian. Technical rept. no. 35 on Contract Nonr-736(00). 1 Feb 60, 47p. 11 refs. AD-234 486.
Order from LC mi$3.30, ph$7.80 PB 153 123

Light scattering of 18 monodisperse polystyrene and polyvinyltoluene latices was investigated at an angle of 90° with respect to an incident linearly polarized beam whose electric vector was, in succession, parallel and perpendicular to the plane of observation. The ratio of the two quantities obtained, designated as scattering ratio, σ -- which is closely related to depolarization and polarization ratio -- was found to be a very useful quantity for absolute particle size determinations except for particle diameters $< 1/4\ \mu$ (on use of visible light), a particular advantage being the relative insensitivity to changes in the solid angle of the scattered beam. Partial investigation of the spectra of σ eliminated the problem of multivaluedness of results inherent in any measurements of lateral light scattering. The various types of concentration dependance of σ, of the individual intensities and also of scattering from unpolarized incident light were investigated in detail and could be explained fully. The particle diameters obtained from σ, evaluated on the basis of theoretical data derived from the Mie-theory, agreed very satisfactorily with electron microscopic results (range covered: 135 mμ to 824 mμ). Except for minor modifications, the high precision apparatus was the same as used in the preceding investigations. (Author)

Wayne State U., Detroit, Mich.
PARTIAL TABULATION OF σ-SPECTRA FOR DETERMINING SIZE DISTRIBUTION CURVES FROM LIGHT SCATTERING, by Morton L. Wallach, Marvin F. Walden and Rodney Wu. Technical rept. no. 36 on Contract [Nonr] 736(00). 1 Mar 60, 21p. AD-234 487.
Order from LC mi$2.70, ph$4.80 PB 153 757

Willow Run Labs., U. of Michigan, Ann Arbor.
ULTIMATE SENSITIVITY AND PRACTICAL PERFORMANCE OF THE TELLURIUM PHOTOCONDUCTIVE DETECTOR, by David F. Edwards. Rept. on Project Michigan, Contract DA 36-039-sc-78801. Dec 59, 10p. 9 refs. Rept. no. 2900-129-R; AD-230 703.
Order from LC mi$1.80, ph$1.80 PB 153 456

Calculations of the ultimate sensitivity and measurements of the practical performance have been made for the tellurium photoconductive detector. For the condition that detector sensitivity is limited by fluctuations of background radiation, the theoretical NEP (noise equivalent power) at the peak of spectral sensitivity ($\lambda = 3.4\mu$) was calculated to be 5.1×10^{-13} watt. For the "best" tellurium detector the measured value of NEP was 3.1×10^{-13} watt at the same wavelength and at the optimum chopping frequency. These values indicate that the tellurium photoconductive detector is background limited and thus is an ideal detector. (Author)

Solid State Physics

Advanced Semiconductor Lab., General Electric Co., Syracuse, N. Y.
APPLICATIONS OF TUNNELING TO ACTIVE DIODES, by N. Holonyak, Jr. Scientific rept. no. 2b on Contract AF 19(604)6623. Oct 60, 67p. 9 refs. AFCRL-TN-60-1141.
Order from LC mi$3.90, ph$10.80 PB 153 873-2

This report covers the results obtained to date in studies of tunneling due to states (bands) in the "forbidden gap" of GaAs and InP, describes a reliability - failure property in GaAs tunnel diodes which bears some resemblance and possibly relationship to formation of "forbidden gap" states, outlines a method of regrowing and doping GaAs (and potentially other compounds) from an alloy-vapor state, and presents some initial results in growing various intermetallic compounds (including epitaxial growth of GaAs) via reaction with a halogen in a closed quartz tube. A theoretical and experimental study of tunnel diode characteristics and their relationship to circuit performance has been undertaken. The circuits that have been studied are as follows: general purpose logic, sequential circuits, pulse generators and drivers, memory, and active R-C filters. Results to date indicate that the practical applications of tunnel diodes are limited. (Author)

Ballistic Research Labs., Aberdeen Proving Ground, Md.
CHARACTERISTICS OF SEVERAL DIELECTRIC MATERIALS AT HIGH PRESSURE, by George Hauver. Oct 60, 18p. 2 refs. Technical note no. 1356; AD-248 025.
Order from LC mi$2.40, ph$3.30 PB 153 649

Some plastics, when subject to high transient pressures, have been found to generate an electric current that is dependent upon the particular plastic, pressure, load resistance, area and thickness. It is suggested that dipole orientation is the dominant mechanism responsible for the current. The resistivity of sulphur has been found to decrease to values less than 0.04 ohm-cm when it is subjected to high transient pressure. Some results are included which indicate that sulphur may possibly be used as a pressure tranducer for measurement of pressure profiles. (Author)

Battelle Memorial Inst., Columbus, Ohio.
BASIC TRANSPORT PHENOMENA IN GERMANIUM AND INDIUM ANTIMONIDE, by R. T. Bate, S. E. Miller, and A. C. Beer. Final rept. on Contract AF 49(638)222. 31 Oct 60, 12p. 6 refs. AFOSR-TR-60-158; AD-246 156.
Order from OTS $0.50 PB 171 511

The growth of InSb single crystals and the transport properties of InSb and semiconducting diamond were studied. Summaries are given of work in: galvanomagnetic effects in InSb; purification and single crystal growth; galvanomagnetic effects in semiconducting diamond; inhomogeneities and associated galvanomagnetic effects in semiconductions.

Battelle Memorial Inst., Columbus, Ohio.
INFLUENCE OF MAGNETOCONDUCTIVITY DISCONTINUITIES ON GALVANOMAGNETIC EFFECTS IN INDIUM ANTIMONIDE, by R. T. Bate, J. C. Bell, and A. C. Beer. Technical note no. 4 on Contract AF 49(638)222. 16 Oct 60, 30p. 15 refs. AFOSR-TN-60-1226; AD-246 424.
Order from LC mi$2.70, ph$4.80 PB 153 199

Anomalous galvanomagnetic effects associated with spatial discontinuities in carrier concentration have been observed in n-type InSb. These discontinuities result from anisotropic segregation of impurities during crystal growth. An increase in the magnitude of the Hall coefficient at 20,000 gauss to nearly twice the weak-field value was observed in one case. The magnetoresistance is especially sensitive to inhomogeneities. For an inhomogeneous sample at a particular magnetic field, the measured $\Delta\rho/\rho_0$ may be as much as 100 times larger than that for a homogeneous sample. Negative magnetoresistance has also been observed at room temperature in inhomogeneous samples. All of the above observations are predicted qualitatively by considering a simple model consisting of a long, thin specimen having a discontinuity in resistivity and Hall coefficient in the current direction. The boundary value problem corresponding to this case is solved to predict the electric field and current densities. (Author)

California U., Los Angeles.
STRESS FIELD CAUSED BY SLIP IN A WORK-HARDENING CRYSTAL IN AN AGGREGATE, by T. H. Lin and D. Martin. Rept. on Contract AF 49(638)20. Oct 60, 33p. 14 refs. Dept. of Engineering rept. no. 60-94; AFOSR-TN-60-1256.
Order from LC mi$3.00, ph$6.30 PB 153 729

The stress field of an aggregate of randomly-oriented crystals loaded just beyond the elastic limit is computed. The elastic modulus of each crystal is taken to be isotropic. The sliding directions and planes of different crystals are different. The initial stage of plastic deformation, at which only the most favorably orientated crystal slides, is considered. This sliding crystal is assumed to be of cubic shape and at the interior of a fine grained aggregate. The aggregate is infinitely large as compared to the crystal. It is shown that the plastic strain gradient is equivalent to body force in the calculation of stress field. The equivalent body force caused by slips in the sliding crystal is considered to apply in an infinite elastic isotropic medium. The known solution of the stress field caused by a concentrated force in an infinite medium is applied to express the stress components in terms of slip distributions in the sliding crystal. The increase of critical shear stress with slip caused by work hardening is considered. The resolved shear stress is equated to this critical shear stress in the sliding region. This gives an integral equation in terms of slips at different points. This equation is solved numerically by the method of finite difference. The stresses caused by these slips are then calculated and shown in graphs. These stresses caused by slips decrease rapidly with the distance from the sliding crystal. (Author)

Curtiss-Wright Corp., Santa Barbara, Calif.
STUDIES ON MAGNETOSTRICTIVE FERRITES, by G. S. Smith. Final progress rept. for Dec 58-Dec 59 on Contract Nonr-2749(00). [1959] 78p. 28 refs. TR 59-80; AD-234 784.
Order from LC mi$4.50, ph$12.30 PB 154 095

An investigation was made of the reproducibility of the properties of magnetostrictive ferrites and of the changes in the properties brought about by small changes in composition. The study was concerned primarily with a correlation of properties with particle size and distribution of the raw and reacted oxides as influenced by chemical composition and the forming and firing variables. The basic compositions studied were $NiO \cdot Fe_2O_3$ and $NiO_{(1-a)} \cdot CoO_{(a)} \cdot Fe_2O_3$. Since the properties of the ferrites varied uniformly as the average particle size of the presintered powder, it was concluded that the physical state of the presintered material must be controlled in order to assure a high degree of reproducibility. Two compositions of $NiO \cdot Fe_2O_3$, which had average particle sizes of 1.52 and 1.55μ were prepared to demonstrate the effect that particle size and firing schedule have on the properties. The samples were fired separately at 1400°C for 1 hr. The maximum variations were: density of ±0.02%; resonant frequency ±0.01%, electromechanical coupling of 0±0.75%; and mechanical Q, of ±1.5%.

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
SINGLE DOMAIN CRITERIA AND THEIR IMPLICATIONS, by Henri Amar. Rept. on Solid State Research and Properties of Matter, Contract AF 33(616)5041. Oct 59, 25p. 12 refs. Interim rept. I-A2033-3; WADC TR-59-547; AD-239 602.
Order from OTS $0.75 PB 171 543

A general and critical review of the various single domain criteria is presented in a uniform notation, and the validity of the various treatments is assessed. While the Stoner-Wohlfarth (S-W) theory is rigorous and valid within its assumptions, the heuristic S-W single domain criterion (only a minor part of their paper) is open to question. Yet on the basis of this criterion, discrepancies have been claimed between S-W theory and the experimental data, and alternative mechanisms (such as fanning) have been proposed. Three independent and rather rigorous investigations led to the same "micromagnetic criterion", at considerable variance with S-W result. Namely, the condition for a prolate ellipsoid of elongation m (and semi-axes R, a = mR) to be single domain, (even in presence of an applied field), is that $R \leq R_m = \lambda r_o D_R^{-1/2}$ where $r_o = A^{1/2} M_s$ is an exchange length, λ a number of order unity and D_R the transverse demagnetizing factor. In the S-W result D_a figures instead of D_R. This implies considerable difference in the linear sizes of the respective critical ellipsoids, and an even greater difference in the critical volumes $v_{sw}(m)$, $v_M(m)$. Since the single domain volume fraction of a powder plays a dominant role in experimental measurements, the ratio $\rho(m) = v_{sw}(m)/v_M(m)$ has been calculated for various values of m. Assuming the single domain sphere to be the same in both cases, and the micromagnetic criterion to be the more correct of the two, it is found that the S-W criterion may lead to an enormous overestimate of the single domain content of a powder, and consequently of the remanence and coercive force. To be specific, it is found that the error ranges from 100% for m = 1.5 to much larger values as m increases. (Author)

General Electric Research Lab., Schenectady, N. Y.
APPLICATIONS OF TUNNELING TO ACTIVE DIODES, by R. N. Hall. Scientific rept. no. 2a on Contract AF 19(604)6623. Sep 60, 11p. 4 refs. AFCRL-TN-60-1141. AD-248 899.
Order from LC mi$2.40, ph$3.30 PB 153 873-1

Electrical measurements of germanium recrystallized from In-Ga solutions are reported. Acceptor concentrations between 1 and 2 x 10^{20} cm^{-3} are found for crystals grown from In containing 0.5 to 1 weight per cent Ga. Tunnel junctions from PbTe and PbS have been prepared and studied. Low temperature electrical measurements yield values for the long wavelength longitudinal optical phonon energies in these semiconductors which are 16 ± 1 and 27 ± 1 milli-electronvolts respectively. Areas of investigation which are still in progress include the preparation of crystals of the lead salt semiconductors by vapor phase transport, measurements of phonon and polaron phenomena in the low temperature electrical characteristics of tunnel junctions, the effect of linear elastic strains upon tunneling current components, and elastoresistance measurements on a variety of semiconducting materials. (Author) (See also PB 152 473)

General Electric Research Lab., Schenectady, N. Y.
THEORETICAL AND EXPERIMENTAL WORK ON FAST DIFFUSION IMPURITY ATOMS IN SEMICONDUCTORS, by E. M. Pell. Final rept. on Contract AF 19(604)5551. 1 Dec 60, 12p. 4 refs. AFCRL-TR-60-375. AD-248 593.
Order from LC mi$2.40, ph$3.30 PB 153 819

Summary of work and publications.

[General Mills, Inc., Minneapolis, Minn.].
INVESTIGATIONS OF BISMUTH TELLURIUM SULFUR COMPOUNDS, by Henn H. Soonpaa. Technical rept. no. 1 (Progress) on Contract Nonr-1589(14). 7 Apr 60, 25p. 4 refs. Rept. no. 1940; AD-235 354.
Order from LC mi$2.70, ph$4.80 PB 154 097

Compounds of the composition $Bi_2(Te, S)_3$ with the Te:S ratio ranging from 100:0 to 50:50 were studied. The single phase crystalline compound, $Bi_2(Te, S)_3$, with the Te:S ratio from 54:46 to 62:38 was different from the natural tetradymite. X-ray powder diffraction patterns were taken of all of the compounds prepared. A table was compiled of the lattice constants, a and c, of the different $Bi_2(Te, S)_3$ compounds. A plot of the ratio of the intensities of the $2\Theta_{110}$ and $2\Theta_{0015}$ lines vs the composition revealed a sharp minimum at a Te:S ratio slightly above 58:42, a new compound corresponding to that composition was substantiated as $Bi_8Te_7S_5$. Two compounds resulting from the mixture of Bi_2Te_3 and Bi_2S_3 are believed to exist. The Hall mobilities and electrical conductivities of the samples seem to become very nearly the same at room temperature for Bi_2Te_3, and the 56:44 and 58:42 compounds.

General Telephone and Electronics Labs., Bayside, N. Y.
ANALYSIS OF TRACE IMPURITIES IN SILICON CARBIDE, by R. Rupp and G. Morrison. Final rept. for 1 Nov 58-31 Oct 60 on Contract AF 19(604)4944. 31 Oct 60, 27p. 3 refs. TR 60-703.9; AFCRL-TR-60-357; AD-248 258.
Order from LC mi$2.70, ph$4.80 PB 153 682

Trace spectrographic techniques that are 2 to 3 orders of magnitude more sensitive than previous methods have been developed. The knowledge obtained has been instrumental in the development of three direct spectrographic methods for the determination of ultratrace impurities in high purity silicon carbide and nickel, and for the determination of traces of boron in silicon. A technical manual describing the procedure for the determination of impurities in silicon carbide is included. (Author)

Illinois U., Urbana.
SELF DIFFUSION IN SILVER DURING PLASTIC DEFORMATION IN TORSION, by J. B. Darby, Jr. (Argonne National Lab.) C. T. Tomizuka (U. of Arizona) and R. W. Balluffi. Rept. on Contract AF 49(638)880. 20 Dec 60, 35p. 13 refs. AFOSR-TN-60-1394.
Order from LC mi$3.00, ph$6.30 PB 153 839

Self-diffusion of Ag^{110} in polycrystals subjected to simultaneous torsion was studied at 700 and ~800°C using the sectioning technique. The effects of straining on diffusion were relatively small in all cases.

Illinois U., Urbana.
A STUDY OF LOW TEMPERATURE RECOVERY OF ELECTRICAL RESISTANCE IN COLD WORKED COPPER CRYSTALS, by J. H. Bredt (Doctoral thesis) and J. S. Koehler. Technical rept. no. 2 on Contract [N]onr-1834(26). Feb 60, 94p. 39 refs; AD-232 831.
Order from LC mi$5.40, ph$15.30 PB 153 138

Efforts were made to clarify the general aspects of the behavior of point defects in the face-centered cubic metals by studying low-temperature recovery of electrical resistance in cold worked Cu crystals. The electrical resistance of every specimen actually used in the experiment was measured in a bath of liquid He. The annealing of 99.998% pure Cu single crystals deformed in compression at 78°K was exceedingly complex. The details of the resistance recovery depended on the exact nature of thermal history; this dependence extended at least as low as 78°K. The activation energies of the effective annealing processes appeared to be distributed more or less continuously over a range of approximately 0.2 to 0.8 ev. Identification of specific values was made ambiguous by the complex structure of the annealing spectrum. An attempt was made to account for the complicated behavior produced by complexities in the kinetic behavior of large, dense aggregates of interstitial atoms caused by the deformation.

Illinois U., Urbana.
VACANCY QUENCHING IN GOLD (I) by Hiroshi Fujiwara. Technical rept. on Contract Nonr-1834(12). [1960] 20p. 14 refs. AD-233 129.
Order from LC mi$2.40, ph$3.30 PB 153 772

The variations of concentrations of single and divacancies in gold during rapid linear quenching (quenching rate 3×10^4°C/sec) are quantitatively obtained over the ranges from quenching temperature to room temperature. In this paper, we assume that (i) only the single and divacancies play a role during quenching and annealing, (ii) total void concentration is constant during quenching. The cases in which the quenching temperature T_0 = 700°C, 800°C and 900°C for each case the binding energy of a divacancy is B = 0.1, 0.2 and 0.3 e.v. are treated. The results show that the concentration of single vacancies decreases with temperature and approaches a limiting value characteristic of T_0 and B near room temperature. If one assumes that all divacancies produced during quenching reach dislocation during quenching, then the fractions of the expected resistance increase which is lost for the case of T_0 = 800°C, are 3%, 18%, and 47% corresponding to the cases of B = 0.1, 0.2, and 0.3 e.v. respectively. Thermal equilibrium of the vacancies breaks at certain temperature, from 500°C to 300°C, corresponding to each case. The value of B must therefore be near 0.1 e.v. (Author)

Illinois U. [Engineering Experiment Station] Urbana.
A STUDY OF THE ALLOYS OF TRANSITION ELEMENTS, by Paul A. Beck. Rept. for 6 Aug 56-14 Aug 60 on Solid State Research and Properties of Matter, Contracts AF 33(616)3789 and AF 33(616)6770. Dec 60, 17p. 12 refs. ARL Technical rept. 60-326.
Order from OTS $0.50 PB 171 113

Correlation of the occurrence of various intermediate phases in alloys of transition elements with the location of these elements in the periodic table suggests a strong effect of the electronic structure. Measurement of the electronic specific heat in body centered cubic alloys in the systems Ti-V, V-Cr, Cr-Fe, Fe-Co, Cr-Mn and V-Fe lead to information regarding the shape of the 3d band. (Author)

Institute of Optics, U. of Rochester, N. Y.
LUMINESCENCE OF MIXED ALKALI HALIDE CRYSTALS, by D. Dutton and K. Teegarden. Final rept. for 1 Aug 58-31 July 60 on Contract DA 30-115-ORD-998. [1960] 4p. 1 ref. OOR rept. 2045.3-P; AD-243 750.
Order from LC mi$1.80, ph$1.80 PB 153 670

A method has been developed for measuring the concentration of iodide ion in KCl:I crystals, utilizing the characteristic absorption band of the I^- ion in water solution. Iodide ion concentrations of 10^{15} cm^{-3} can be determined in this way in the presence of 10^{20} Cl^- ions/cm^3. The lower limit of the method is set by the overlap of the Cl^- band with the iodide band at 2500 A. The excitation and emission spectra of a KCl crystal containing about 0.01 per cent KI have been investigated using the vacuum monochromator. No luminescence occurs at room temperature. At 80° K excitation bands occur at 6.73 and 7.18 ev; these correspond to the iodide ion absorption bands. The 7.18 ev absorption band appears on the "tail" of the KCl absorption edge, but is quite distinct in the excitation spectrum. An additional excitation band is observed at 7.6 ev. This is well within the strong-absorption region of KCl. Excitation in any of these bands gives rise to a broad emission band peaking at 3.06 ev. In nominally pure KCl, at 80° K there is an excitation band at 7.6 ev. The observations have been repeated on additional samples of KCl and KCl:I with the same qualitative results. (Author)

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
INTERACTION OF A POLARIZABLE POTASSIUM CHLORIDE CRYSTAL WITH A VALENCE-BAND HOLE, by Stephen J. Nettel. Rept. on Contract Nonr-1841(10). Mar 60, 52p. 25 refs. Technical rept. 146; AD-235 468.
Order from LC mi$3.60, ph$9.30 PB 153 741

The interaction of a valence-band hole with a potassium chloride crystal, when crystal-hole correlations are considered, is studied by variational means. A crystal trial wave function is constructed which allows for the ionic polarizability of the crystal by means of a correlation between the crystal configuration and the motion of the hole. The expectation value of the Hamiltonian operator for the crystal is found by integrating over both electronic and nuclear coordinates. The necessary matrix elements of the electronic energy operators are taken from a previous calculation by Howland (Phys. Rev. 109:1927, 1958). The total energy expectation is minimized with respect to a single parameter in the wave function that measures the hole-lattice correlation. The valence bands obtained when the crystal lattice is treated as rigid become completely flat; a result which implies

that the hole is self-trapped. The modification that are introduced by the addition of the electronic polarizability are studied by repeating the previous calculation with a refined wave function. Consideration is given to the energy bandwidths when the electronic but not the ionic polarizability is active, since these may be compared with experimental widths derived from X-ray emission spectra. (Author)

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ANISOTROPY IN NICKEL-IRON FILMS, by D. O. Smith. Rept. on Contract AF 19(604)7400. 2 Dec 60, 40p. 48 refs. 53G-0047; AD-247 895.
Order from LC mi$3.00, ph$6.30 PB 153 563

The magnetic and optical anisotropies of evaporated nickel-iron films deposited at an angle to the substrate normal are sensitive to the rate of deposition and the orientation of the magnetization M during deposition. It is postulated that crystallite elongation toward the vapor beam or in the direction of M occurs.

Lincoln Lab., Mass. Inst. of Tech., Lexington.
CLASSICAL THEORY OF THE GROUND SPIN-STATE IN SPINELS, by T. A. Kaplan, K. Dwight and others. Rept. on Contract AF 19(604)7400. 7 Dec 60, 30p. 26 refs. 53G-0043; AD-248 364.
Order from LC mi$2.70, ph$4.80 PB 153 699

An investigation of the ground state of the classical Heisenberg exchange energy in spinels has led to several new results. By means of a recent generalization of the method of Luttinger and Tisza, the ground state has been rigorously obtained in the part of the exchange parameter space defined by nearest neighbor AB and BB interactions for tetragonally distorted spinels. The regions in this space where the Neel and Yafet-Kittel configurations minimize the energy are much smaller than predicted by the Yafet-Kittel six-sublattice theory. Outside of these regions, there exists a domain where the ground state is an antiferromagnetic spiral similar to those recently introduced in the literature. In still other regions, the ground state is a new type of spiral which is ferrimagnetic. (Author)

Metals Research Lab., Brown U., Providence, R. I.
THE RELATION BETWEEN THE PLASTIC DEFORMATION OF ALUMINUM SINGLE CRYSTALS AND POLYCRYSTALS, by Stephen Howe and Charles Elbaum. Final rept. on Contracts Nonr-562(12) and Nonr-562(27). 1 May 60, 29p. 9 refs. AD-238 992.
Order from LC mi$2.70, ph$4.80 PB 148 559

Single crystals of <100>, <111>, and <110> axial orientation, and polycrystals, both of 99.99% pure aluminum, were deformed in tension at temperatures of 27°C, 200°C, 400°C and 600°C. The experiments on single crystals reveal that as the temperature is increased, the shear stress-shear strain curves for the three orientations become more and more similar until at 600°C they are identical. On the other hand the surface appearance of the crystals strained at 600°C indicates that the mode of deformation depends drastically on orientation. Taylor's criterion for the comparison of the stress-strain curves of single and polycrystals was found to be valid at 27°C. As the temperature is raised, however, the criterion ceases to be applicable.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
TRANSMISSION LINE FORMULATION FOR SEMICONDUCTORS, by P. Parzen. Rept. on Contract DA 36-039-sc-73052. 12 Mar 59, 84p. 13 refs. Research rept. R-712-58; PIB-640; AD-218 374.
Order from LC mi$4.80, ph$13.80 PB 153 932

In the transmission line method of band structure, the crystal is divided into periodically displaced regions bounded by crystal planes passing through atomic sites, which contain subregions with almost constant potential. The Schroedinger equation is solved in the subregions in terms of incident and scattered plane waves satisfying proper Bloch conditions in directions parallel to the crystal planes. The incident and scattered waves are related via the scattering of an electron wave by the 2-dimensional lattice of a crystal plane. The plane wave amplitudes are constrained to satisfy the Bloch condition along a lattice direction not parallel to the crystal planes, thereby determining energy as a function of wave number. Different atoms per unit cell require the solution of appropriate scattering problems which may be tabulated and used to compute the band structure of solids built up of arbitrary crystal planes. The symmetry properties induced by the symmetry operations of the two dimensional lattices in the crystal plane are determined. Detailed computations for Li are given. (Author) (See also PB 146 454)

Naval Ordnance Lab., White Oak, Md.
A SURVEY OF BASIC RESEARCH IN THERMOELECTRICITY, by Wayne W. Scanlon. 1 June 59, 14p. 25 refs. NAVORD rept. 6663; AD-220 241.
Order from LC mi$2.40, ph$3.30 PB 154 770

This report released for sale to the public 15 Mar 61.

The present status of research in the general area of thermoelectricity was surveyed for the purpose of evaluating the present understanding of the phenomena and to point out areas where additional knowledge is needed. Thermoelectric effects were considered in metals and insulators as well as in semiconductors. As a result of this study it is apparent that even in the simplest monatomic metals such as the alkali metals, the theory is unable to account qualitatively or quantitatively for the observed behavior. Wide discrepancies are found in some of the metals which are generally believed to approximate closely the ideal free electron behavior. (Author)

Ohio State U. Research Foundation, Columbus.
AMPLITUDES OF VIBRATION AND X-RAY SCATTERING OF CRYSTALLINE LITHIUM HYDRIDE AND LITHIUM DEUTERIDE: 300°K TO 20°K, by C. K. Stambaugh and P. M. Harris. Technical rept. no. 2 on Order-Disorder Transformations in Crystals, Contract N6onr-225-17. Jan 53, 52p. 30 refs. AD-10 920.
Order from LC mi$3.60, ph$9.30 PB 154 807

This report released for sale to the public 17 Mar 61.

Intensities of Laue-Bragg scattering from powdered crystals of LiH and LiD were obtained at 20°, 77°, 194°, and 303°K with a recording G-M counter spec-

trometer and a special Dewar specimen mount. Relative crystal-structure factors and relative atomic form factors were calculated from the intensities; absolute atomic form factors and characteristic temperatures were obtained from the relative form-factor values. Temperature coefficients and amplitudes of vibration were calculated from the characteristic temperatures. Electron-density distributions for LiH, obtained from the absolute atomic-form-factor data, were used to calculate radial charge distributions. Evidence was discovered which suggested a change in the ionization state of the crystals with changes in temperature.

Ohio State U. Research Foundation, Columbus.
A THEORETICAL STUDY OF THE SIMULTANEOUS DIFFUSION OF TWO IMPURITIES INTO SILICON THROUGH AN OXIDE LAYER, AND THE DIFFUSION OF BORON INTO SILICON THROUGH DIOXIDE FOR 0.001 PER CENT SOURCE STRENGTH OF BORON, by M. O. Thurston, J. Tsai, and K. D. Kang. Quarterly technical rept. no. 6, 1 Apr-30 June 60, on Diffusion of Impurities into Silicon Through an Oxide Layer, Contract DA 36-039-sc-83874. 2 Aug 60, 26p. Rept. 896-6; AD-244 694.
Order from LC mi$2.70, ph$4.80 PB 153 603

A theoretical study of the simultaneous diffusion of two impurities into silicon through an initial oxide layer to produce junction transistors is given in the first part of this report. Relations among the diffusion time and impurity surface concentrations are given in terms of initial oxide layer thickness, R's and the junction depths. As a special case, the thin base layer is considered. Possible design procedures are suggested. No experimental data were obtained. Experimental results of boron diffusion from a 0.001 per cent source are given in the second part of this report. It was observed that the saturated surface concentration has nearly a constant value and is higher than the source concentration. This suggests that at low source strength the saturated surface concentration may be independent of source strength. It was suggested that there may be a segregation phenomenon at the silicon-oxide interface. On the oxide side at the interface boron has a slightly higher concentration than on the silicon side. (Author)

Raytheon Co., Waltham, Mass.
RESEARCH STUDIES AND INVESTIGATIONS OF THE SOLID STATE CHEMISTRY OF FERRITES, by A. E. Paladino, Jr. Final rept. for 15 Jan 58-15 Jan 59 on Contract DA 36-039-sc-74987. [1959] 58p. 26 refs. AD-213 430.
Order from LC mi$3.60, ph$9.30 PB 153 238

Phase equilibria in the systems Fe-Ni-O and Fe-Mg-O have been investigated in the ferrite regions up to a temperature of 1300°C. A "vacuum" technique for determining equilibria relationships in these systems is described and data are reported for oxygen pressures from one to 0.01 atmospheres. DC resistivity measurements have been made on $Ni^{2+}_{1-x}Fe^{2+}_{x}Fe^{3+}_{2}O_4$, where x varied from 0 to 1. (Author)
(See also PB 137 195)

Rome Air Development Center, Griffiss AFB, N. Y.
CERTAIN PHYSICAL PROPERTIES OF SOME INTERMETALLIC COMPOUNDS OF Mn AND As, by Joseph B. Brauer. Oct 60, 60p. 30 refs. RADC-TR-60-165; AD-246 808.
Order from LC mi$3.60, ph$9.30 PB 153 264

The system Mn-As is representative of a series of binary systems consisting of a transition metal and one of the sub-group elements. Most of these systems are characterized by a number of definite intermetallic compounds and present complex phase diagrams. Unusual electrical and magnetic behavior of the compounds and alloys in the Mn-As system and conflicting data reported by previous investigators led to this study of certain compositions within the range of 30 to 50 atomic percent arsenic. Alloys were prepared with composition near that of the reported compounds MnAs, Mn_4As_3, Mn_3As_2, and Mn_2As. Two alloys on either side of the composition of Mn_3As_2 were subjected to dilatometric measurements; electrical resistivity measurements were made on the alloy approximating Mn_4As_3; and all alloys were studied using metallographic and X-ray diffraction techniques. Expansion and electrical resistivity vs. temperature curves are discussed, correlations of the X-ray powder diffraction patterns are described and photomicrographs of the various alloy structures are presented. (Author)

Synthetic Mica Co., Caldwell, N. J.
SYNTHETIC MICA CRYSTAL GROWTH PROGRAM, by John G. Froemel, Edgar C. Worden, and Philip S. Hessinger. Interim technical engineering rept. no. 1, 16 May-16 Aug 58, on Contract AF 33(600)36853. [1958] 96p. 241 refs. AD-205 707.
Order from LC mi$5.40, ph$15.30 PB 154 515

This report released for sale to the public 2 Mar 61.

Methods are being developed for growth of large (4" x 6") synthetic mica crystals on a commercial scale. Special furnacing techniques are being evaluated on an in-plant basis including progressive (step) melting, controlled cooling schedules, seeding methods and melt super heating. In the laboratory, special crystal growing techniques such as zone melting, crystal pulling and thermal gradient crystallization are under study on both mica melt and solutions. The report describes the first plant scale progressive melt, composition control experiments, and other preliminary studies. Mica crystal growth theory is discussed, and the initial design of a laboratory crystal growing apparatus is presented. The experimental work being conducted on solution growth is described and a comprehensive bibliography of synthetic mica references is included.

Utah U., Salt Lake City.
HIGH PRESSURE PHYSICS, by P. Gibbs, G. S. Baker and others. Rept. on Solid State Research and Properties of Matter, Contract AF 33(616)5016. Dec 60, 47p. 11 refs. ARL Technical rept. 60-330.
Order from OTS $1.25 PB 171 049

An apparatus for producing and measuring pressures to 20,000 atmospheres using a liquid or a gas environment has been constructed and tested. The pressure chamber has a working space 1 inch in diameter and 4 inches long and is designed for use with internal heating to 1000°C. A new type plug has been designed and tested allowing 8 electrical leads to be brought into the pressure chamber. A torsional pendulum for measuring internal friction inside the pressure vessel has been constructed and instrumented. Damping measurements on ~.06 inch diameter wire specimens can be made over a strain amplitude range of $\varepsilon = 10^{-6}$ to 10^{-4}. Provision is made for an internal furnace heating the specimen over a wide temperature range. A creep apparatus has been constructed and tested. Preliminary results on tin have shown a definite slowing down of creep due to the application of pressure. An activation volume for the process is estimated. (Author)

Theoretical Physics

Carnegie Inst. of Tech., Pittsburgh, Pa.
ATOMIC LINE SHAPES FROM A PLASMA, by Bernard Mozer. Technical rept. no. 3 on Contract Nonr-760(15). [1960] 208p. 47 refs. AD-237 043.
Order from LC mi$9.30, ph$31.80 PB 147 748

Several line shapes emitted by atoms in a plasma were calculated. The free ions and electrons in the gas which are responsible for broadening and shifting the emitted radiation are considered to be classical particles. The simultaneous effect of these perturbers on the emitting atom is treated by considering the ions in the static approximation and the electrons in the impact approximation. Strict regard is paid to the validity of these approximations. The line shapes are calculated by a method which assumes that the static ionic electric field splits the line into its Stark components. The impact electrons then broaden each component causing them to overlap. The resulting line shape is obtained by averaging the broadened, overlapping Stark components over all ionic fields multiplied by an appropriate distribution. A theory of impact-broadened overlapping lines developed by Kolb was used to calculate the effect of the electrons. New ionic field distributions which are important for hydrogen line shapes were calculated by a new method which included the correlations between the charged particles in the gas. A calculated Balmer β line shape was in close agreement with a recent precise measurement. The close agreement between these results emphasizes the importance of the electrons in directly broadening the Stark components and indirectly modifying the ionic field distribution. (Author)

Electronics Research Lab., U. of California, Berkeley.
EXTRACTION AND MODULATION OF ELECTRON BEAM FROM PHILIPS ION GAGE, by R. E. Lundgren. Scientific rept. no. 9 on Contract AF 19(604)2270. 31 Aug 60, 74p. 23 refs. IER series no. 60, issue no. 306; AFCRL-TN-60-1100; AD-247 432.
Order from LC mi$4.50, ph$12.30 PB 153 488

A cold-cathode electron source is investigated in an extension of the work done by Savarin in which an electrode structure similar to that of the Philips Ion Gage is used to generate a low pressure plasma from which a beam of electrons is extracted. In the present work the electron beam is modulated by varying the density of the plasma through control of the appropriate electrode voltages. Measurements were made to determine the extracted electron beam current as functions of magnetic field, gas pressure, and the several electrode voltages. Both dc and pulsed measurements are described. Special attention is paid to the properties of the device when the two cathodes are at different potentials, and some proof is presented for a theory explaining the negative-resistance characteristics of the asymmetrical Philips Ion Gage. The emission efficiencies obtained for pulsed operation were comparable with those for a pure tungsten thermionic cathode, the maximum measured being 7.2 ma/w. Although instantaneous emission efficiencies are low, the average emission efficiency may be higher than even that of an oxide-coated cathode for pulsed operation because of the necessity of supplying heating power to a thermionic cathode during the time between pulses. (Author)

Free U. of Berlin (West Germany).
A DERIVATION OF BOLTZMANN EQUATION WITH THE HELP OF AN ASSUMPTION OF DETERMINACY, by Günther Ludwig. Technical rept. no. 1 on Theoretical Research Studies of Reacting Plasmas, Contract AF 61(052)239. [1960] 35p. AFOSR-TN-60-1405; AD-246 970.
Order from LC mi$3.00, ph$6.30 PB153 311

Institute of Mathematical Sciences, New York U., N. Y
THE GREEN'S FUNCTION METHOD FOR QUANTUM CORRECTIONS TO THE THOMAS-FERMI MODEL OF THE ATOM, by Gene A. Baraff and Sidney Borowitz. Rept. on Contracts AF 19(604)4555. DA 30-069-ORD-2581, and Nonr-285(49). Aug 60, 37p. 12 refs. Research rept. no. CX-50; AFCRC TN-60-464 [sic].
Order from LC mi$3.00, ph$6.30 PB 150 946

A systematic method is presented for deriving the Thomas-Fermi equation for an atom and the quantum corrections from the many body description. The novel feature of the method is that it does not require any a priori assumptions about the distribution of the electrons in phase space but shows instead that the distribution which is usually assumed is a direct consequence of specifying that the many particle system is in its ground state. The procedure used in the derivation is the expansion of the mixed position-momentum representation of the Green's function in a series of powers of h. The lowest order term is found to correspond with the Thomas-Fermi density. The form of the higher order terms, which are to be considered as corrections to zeroth order term, depends on the approximations made in the many body equations for obtaining the Green's function. This paper deals only with the Hartree-Fock approximation, but the methods presented here allow generalization to

other approximations which can include correlation effects. (Author)

Institute of Tech., U. of Minnesota, Minneapolis.
DELAY-DIFFERENTIAL EQUATIONS AND AN APPLICATION TO A TWO-BODY PROBLEM OF CLASSICAL ELECTRODYNAMICS, by Rodney D. Driver. Technical rept. for 16 June-15 Aug 60 on Problems in the Theory of Ordinary Differential and Difference Equations, Contract DA 11-022-ORD-3369. July 60, 63p. 11 refs. OOR rept. 2560.1-M; AD-243 177.
Order from LC mi$3.90, ph$10.80 PB 153 679

A system of delay-differential equations is considered. The equations describe the variation with time of an n-tuple, the derivative of each component of each n-tuple being dependent upon the n-tuple itself as well as time and some delay functions. The question considered is: what initial data is sufficient for a system of delay-differential equations in order that the problem of predicting the future will be well set? (Author)

Institute of Theoretical Physics, Stanford U., Calif.
NEUTRON-PROTON PAIRING INTERACTION, by A. N. Saxena. Technical note no. 26 on Contract AF 49(638)388. Aug 60, 19p. 15 refs. AFOSR-TN-60-1133; AD-246 634.
Order from LC mi$2.40, ph$3.30 PB 153 186

The neutron-proton pairing interaction λ between the last odd neutron and the last odd proton in the outermost neutron and proton shells of a nucleus has been estimated in the regions $Z > 20$, $N > 20$ and $Z > 40$, $N > 50$. Behavior of λ in these two regions and in the heavy nuclei region $Z > 82$, $N > 126$, as estimated by Ghoshal and Saxena, is discussed. Also, it is shown that λ arises due to the Wigner force and it is proportional to $(2j_1 + 1 - 2z)(2j_2 + 1 - 2n)$, where z is the odd number of protons in the outermost proton shell j_1, and n is the odd number of neutrons in the outermost neutron shell j_2 of the odd-odd nucleus. (Author)

Institute of Theoretical Astrophysics, U. of Oslo (Norway)
ON PLANE STATIONARY SHOCK WAVES IN A PLASMA, by Kjell Vøyenli. Scientific rept. no. 3 on Contract AF 61(052)49. 1959, 85p. 25 refs. AFOSR TN-60-424; AD-236 337.
Order from LC mi$4.80, ph$13.80 PB 152 656

Equations for plane stationary shocks in a plasma are developed from a general continuum description of a fully ionized plasma consisting of one type of ions and electrons. The shock equations are independent of the viscosity and the thermal and electric conductivity of the plasma. When the magnetic field and the flow velocity are perpendicular to the shock front, the equations are reduced to the familiar form for an ordinary gas. When the magnetic field is parallel to the shock front ("parallel shock"), there is a strong formal analogy with the non-magnetic case. Several important results may consequently be transferred directly from the theory of shocks for ordinary gases. The general case is considered where the magnetic field forms an arbitrary angle with the shock front ("oblique shock"). The magnetic field loses its importance for the motion when the shock is strong, and a weak shock may be considered as a parallel shock.

Institute of Theoretical Physics, Stanford U., Calif.
PION PARAMETERS FROM HIGH ENERGY INELASTIC INTERACTIONS, by S. D. Drell. Technical note no. 25 on Contract AF 49(638)388. Aug 60, 11p. 7 refs. AFOSR-TN-60-1134; AD-246 633.
Order from LC mi$2.40, ph$3.30 PB 153 185

The physical principle that a transition amplitude has a pole for real one-particle intermediate states is applied to various experimental arrangements in order to check their quantitative content and to determine pion interaction constants.

Institute of Theoretical Physics, Stanford U., Calif.
SPECTRA OF ODD-ODD NUCLEI, by A. deShalit and J. D. Walecka. Technical note no. 24 on Contract AF 49(638)388. Aug 60, 39p. 19 refs. AFOSR-TN-60-1137; AD-246 632.
Order from LC mi$3.00, ph$6.30 PB 153 189

A general discussion of the spectra of odd-odd nuclei is presented. For this purpose it was found useful to develop a new method for the calculation of energy levels. An explicit expression is derived for the distribution of the relative angle of the two particles, properly weighted according to the spin-dependence of the interaction. With the help of these expressions the general structure of spectra of odd-odd nuclei can be more clearly seen. In particular the modified Nordheim rules are seen to hold quite generally, and it is found that for configurations containing a half-filled shell the lowest state has an even or odd J according to whether its parity is odd or even. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
A SELF-CONSISTENT FIELD THEORY OF QUANTUM ELECTRODYNAMICS, by Mendel Sachs and Solomon L. Schwebel. Technical rept. on Physics. May 60, 51p. 16 refs. LMSD-288254; AD-244 204.
Order from OTS $1.50. PB 171 533

A self-consistent field theory of quantum electrodynamics is developed which is based on the postulate that the laws of nature must be described in terms of field variables which may be associated only with elementary interactions. Coupled with this postulate is a reinterpretation and reformulation of the Maxwell-Lorentz theory of electromagnetism. The theory is deterministic and is a field theory in the tradition of Einstein and Maxwell. Quantum mechanics is interpreted as a statistical theory of elementary interactions. One consequence of this theory is the rejection of the photon as an elementary particle and its replacement by a state of the particle-antiparticle pair. The concept of a particle acting on itself has no meaning in the present theory. An application of the theory to a system of identical particles reveals mathematical consequences which are identical to those obtained from the Pauli exclusion principle. A study made of positronium reveals in detail the structure of the theory. Annihilation and creation processes of particle-antiparticle pairs are shown to be states of this two-particle system. (Author)

Maryland U., College Park.
ANALYTICITY IN THE COUPLING CONSTANT AND BOUND STATES IN POTENTIAL THEORY, by B. Bosco (Brookhaven National Lab.) and J. Sucher. [Rept. on Contract AF 49(638)24] Nov 60, 11p. 9 refs. Dept. of Physics Technical rept. no. 199; [AFOSR] TN-60-1434; AD-248 970.
Order from LC mi$2.40, ph$3.30 PB 153 872

A method for determining the wave function in potential scattering, from the S-matrix, using unitarity and analyticity, is extended to the case where bound states are present by using analytic continuation in the coupling constant. A numerical example is given, illustrating the passage of a pole from the second Riemann sheet of the energy to the first sheet. (Author)

Parke Mathematical Labs., Inc., Carlisle, Mass.
ON THE EVALUATION OF FEYNMAN PATH INTEGRALS, by Fazil Erdogan. Scientific rept. no. 1 on Contract AF 19(604)7316. 20 Sep 60, 48p. 15 refs. AFCRL-TN-60-1109. AD-246 923
Order from LC mi$3.30, ph$7.80 PB 153 282

After a technical description of the Feynman path integral formulation of quantum mechanics the report treats several practical methods of evaluating path integrals: (1) parameterization by means of orthonormal functions, with examples, (2) approximation by n-parameter family of curves. The determination of normalizing factors is treated, with illustrative examples. Energy eigenvalues and a quasi-classical approximation are treated in terms of path integrals. A first crude step is taken toward a geometrization of quantum mechanics in terms of path integrals in action space. (Author)

Pennsylvania State U., University Park.
AN INVESTIGATION OF THE MACROSCOPIC EQUATIONS FOR A PLASMA, by H. Li and R. D. Mathieu. Technical rept. no. 13 on Contract AF 49(638)647. May 60, 35p. 13 refs. AFOSR-TN-60-1070.
Order from LC mi$3.00, ph$6.30 PB 153 432

The macroscopic equations for the conservation of mass, momentum, and energy, which are deduced from the particle viewpoint by using the classical Boltzmann equation, are investigated for both a nonreacting plasma and a reacting plasma. The most general form of these equations is presented for variable material constants, i.e. dielectric constant and magnetic permeability. The resulting equations are compared with equations which have been obtained from the continuum viewpoint of a control volume and a control surface for the plasma. (Author)

Plesset, E. H., Associates, Inc., Los Angeles, Calif.
COLLISION CROSS SECTIONS THEORY AND PRACTICE, FORMAL THEORY FOR DISTINGUISHABLE SPINLESS PARTICLES, by Edward Gerjuoy. Scientific rept. no. 2 on Contract AF 19(604)6187. 17 Oct 60, 38p. C25-60(U)43; TR-104; AFCRL-TN-60-1153.
Order from LC mi$3.00, ph$6.30 PB 153 499

A review is given of the formal theory used to compute reaction rates resulting from arbitrarily complicated collisions between "aggregates" of spinless distinguishable particles, with special reference to atomic and molecular collisions of interest in Air Force problems. This restricted theory serves as an introduction to the more realistic and more complicated case of collisions between systems of indistinguishable particles possessing spin. (Author)

Stevens Inst. of Tech., Hoboken, N. J.
INVESTIGATION OF PLASMA ACCELERATION, by K. C. Rogers, D. Finkelstein, and G. Brucker. Semi-annual progress rept. no. 7, 1 Jan-10 Sep 60, on Megatron Acceleration, Contract DA 36-039-sc-78097. [1960] 71p. 8 refs. SIT P-21(10/30); AD-245 936.
Order from LC mi$4.50, ph$12.30 PB 153 934

Experimental and theoretical results on pulsed magnetic field shaping and high-voltage, high-current switching are summarized. Work on plasma betatron theory and plasma injection into plasma betatrons is discussed. (Author)

Thermodynamics

Aeronautical Research Lab., Air Force Research Div., Wright-Patterson AFB, Ohio.
EXPERIMENTAL STUDIES ON THE INTERACTION OF STRONG SOUND FIELDS WITH FREE CONVECTION BOUNDARY LAYERS, by E. E. Soehngen and J. P. Holman (Southern Methodist U.). Oct 60, 79p. 108 refs. ARL Technical rept. 60-323; AD-249 104.
Order from OTS $2.00 PB 171 485

Experiments have been conducted on the interaction of strong sound fields with free convection boundary layers on horizontal heated cylinders of 0.750-inch diameter. The interaction effects were observed through the measurements of the total heat transfer from the cylinders to air under the influence of different types of sound environments. Three different types of sound fields were employed for the experiments: (1) Standing plane waves generated by loudspeakers in an anechoic chamber; (2) Traveling plane wave fields generated by a mechanical siren in an anechoic duct; and (3) Constant pressure or diffuse sound fields generated by a mechanical siren in a reverberant chamber. In all cases the generated sound was monochromatic. The frequencies covered a range from approximately 1000 to 6000 cps at sound intensities ranging from 0 to 152 DB. The temperature difference between the test cylinder and air was varied between 20 to 250°F.. (Author)

Massachusetts Inst. of Tech., Cambridge.
LIQUID AND GAS DISTRIBUTION IN THE TWO-PHASE BOILING ANALOGY, by Graham B. Wallis and Peter Griffith. Technical rept. no. 13 on Contracts N5ori-07894 and Nonr-1848(39) [sic]. 1 Dec 58, 89p. AD-209 391.
Order from LC mi$4.80, ph$13.80 PB 154 967

This report released for sale to the public 17 Mar 61.

This report contains a description of the design and operation of an experimental apparatus for the analysis of two-phase flows similar to those occurring in boiler tubes at low pressures. Velocity and density profiles of air-water mixtures are determined across a passage in which boiling conditions are simulated by pumping air through porous walls into a water stream. Photographs of the flow patterns are also presented as a qualitative check on the quantitative data. The results obtained are: (1) Velocity and concentration profiles of the two phases for various values of the flow rates of each. (2) A classification of the flow into several patterns or regimes with quantitative data describing each regime. The data is suitable for use in comparing the physical phenomena with mathematical models and for developing a more accurate theoretical treatment of the flow of boiling fluids in heated channels. (Author)

Massachusetts Inst. of Tech., Cambridge.
MEASUREMENTS OF THE THERMAL CONDUCTIVITIES OF GASES AT HIGH TEMPERATURES, by Robert G. Vines. Rept. on Contract Nonr-1858(25) Sep 58, 20p. 12 refs. Proj. Squid Technical rept. MIT-20-P; AD-205 694.
Order from LC mi$2.40, ph$3.30 PB 154 432

This report released for sale to the public 8 Mar 61.

The determination of thermal conductivities at high temperatures is unusually difficult because the large heat losses produce thermal instability in experimental equipment. Investigations previously carried out in this laboratory have shown that measurements above 500°C are often liable to errors of up to 20%. In the work reported here a system of high thermal capacity was employed, and consistent and reproducible results were obtained; it thus seems likely that the conductivity values given are substantially correct, and that reasonably accurate high temperature measurements have been achieved. (Author)

Naval Ordnance Lab., White Oak, Md.
REVIEW OF METHODS FOR MEASURING TEMPERATURES UP TO 20,000°K, by Harold Hurwitz. 6 July 59, 33p. 46 refs. NAVORD rept. 6680; AD-232 698.
Order from LC mi$3.30, ph$7.80 PB 154 722

This report released for sale to the public 15 Mar 61.

The measurement of high temperatures is considered from the standpoint of the requirements of the NOL high-temperature testing facilities. For temperatures of test specimens, measurements by means of the thermocouple, radiation pyrometer, and optical pyrometer are discussed. Methods considered for gas temperatures, both in combustion flames and in electric arc plasmas, include the measurement of intensities or widths of spectral lines, as well as radiance methods utilizing a comparison radiator. Among these latter, a method is proposed for using an optical pyrometer with a comparison radiator, cooler than the flame being studied, but this requires further development. Certain of the methods discussed are recommended for use in specific circumstances. (Author)

Naval Ordnance Test Station, China Lake, Calif.
GENERAL ENTHALPY-TEMPERATURE-ENTROPY DIAGRAM FOR IDEAL GASES AND GAS MIXTURES UP TO 5000°K, by W. C. Noeggerath. Rept. for Sep 53-June 54. 28 June 54, 101p. 9 refs. NOTS 882; NAVORD rept. 3341.
Order from LC mi$5.70, ph$16.80 PB 154 755

This report released for sale to the public 16 Mar 61.

A method is developed for the correct presentation of a property function of a group of substances by a single, general set of curves. The method is applied to the representation of entropy and enthalpy functions for ideal bi- and tri-atomic gases, and general diagrams are presented from which enthalpy and entropy values can be read by attributing appropriate parameters to individual gases and mixtures. The diagrams cover the temperature ranges from 298.16° to 5000°K and from 200° to 1700°K, and fulfill, for most practical purposes, the function of combined enthalpy-entropy (Mollier) charts. The parameters for specific substances have simple and constant values for the three gases most commonly encountered (N_2, H_2O, CO_2), and are nearly constant over the major part of the temperature range for the other bi- and tri-atomic gases and for some higher-atomic gases. For most practical applications, constant parameters can be used with gas mixtures to yield results within the permissible error. Correct parameters are presented for H_2, CO, O_2, OH, NO, H, and O, and can be calculated for other gases from known enthalpy and entropy values. (Author)

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
APPLICATION OF COVERT'S APPROXIMATIONS FOR THE BINARY BOUNDARY-LAYER TO A POROUS CONE WITH A SOLID TIP, by James P. Moran. Rept. on Contract AF 49(638)245. June 60, 82p. 11 refs. Technical rept. 442; AFOSR-TN-60-834; AD-247 915.
Order from LC mi$4.80, ph$13.80 PB 153 103

Covert's approximations to the solutions to the laminar binary boundary-layer equations as derived by Baron are critically analyzed for the case of helium injected into an air boundary layer. The assumed constant similarity integrals employed by Covert are evaluated for a helium air boundary layer by use of the exact wedge-flow solutions of Baron and Scott. These approximate relations are applied to the problem of a porous cone having a solid tip. The porous region is of such a composition that an injection distribution of the form $k\sqrt{x_c}$ exists when both inside and outside walls are at constant pressures. The solutions show that the approximations to the shear and concentration equations give reasonable results, but that the approximations to the energy equation do not. A comparison between these results and correct solutions obtained by a finite difference formulation are presented in another report. (Author)

Research Inst., Temple U., Philadelphia, Pa.
HIGH TEMPERATURE PROJECT, by A. V. Grosse and J. B. Conway. Progress rept. no. 4, 1 Dec 50-1 July 51, on Contract N9onr-87300. 31 July 51, 31p.

3 refs. AD-135 202.
Order from LC mi$3.00, ph$6.30 PB 154 842

This report released for sale to the public 17 Mar 61.

The experimental work was concerned primarily with the following topics: (a) Centrifugal reactors for the combustion of aluminum. (b) The combustion of metal powders. (c) The production of aluminum vapors. (Author) (See also PB 137 762)

Research Lab. of Heat Transfer in Electronics, Mass. Inst. of Tech., Cambridge.
THE INFLUENCE OF VERTICAL VIBRATIONS ON THE RATE OF HEAT TRANSFER FROM A HORIZONTAL CYLINDER IN AIR, by C. Teleki. Thesis. Rept. on Contract AF 33(616)6076. Oct 60, 65p. 19 refs. WADC Technical note 59-357.
Order from OTS $1.75 PB 171 484

This report contains the results of an experimental investigation of the influence of mechanical vibrations on the rate of heat transfer from a heated horizontal cylinder in otherwise undisturbed air. The cylinder was subjected to temperature potentials and uniform sinusoidal vertical vibrations whose principal variables lay within the following experimental ranges: frequency, f: 54 to 225 cps; amplitude, a: 0 to 0.16"; product of amplitude times frequency, af: 0 to 1.1 ft/sec; temperature potential, Δt: 15 to 150°F; cylinder diameter, D: 7/8". For the same temperature potential, the heat-transfer coefficient was observed to increase in the presence of intense vibrations by as much as 200 per cent of its value without vibrations. Analysis of the experimental results shows that this increase is a function of only one vibrational parameter, namely, the product of amplitude and frequency, af. The quantitative results are presented in the form of three graphs which can be used to predict the coefficient of heat transfer for geometries similar to those of the present investigation. (Author)

Wave Propagation

Dayton U. Research Inst., Ohio.
CHARTS OF CORRECTIONS TO RADAR OBSERVATIONS FOR REFRACTION BY TERRESTRIAL ATMOSPHERES, by Paul B. Taylor and Nicholas A. Engler. Rept. on Contract AF 33(616)5438. Feb 60, 148p. 15 refs. Research rept. 427-71; WADC Technical rept. 59-619; AD-239 322.
Order from OTS $2.75 PB 171 544

There are presented in chart form corrections for atmospheric refraction to observations of range and angular altitude of targets observed by electromagnetic radiation at either visual or radar wave lengths. These correlations have been computed for sixteen type atmospheres above a spherical earth. In these atmospheres the index of refraction attenuates exponentially with height. The type atmospheres cover a range of base indices and exponential attenuation rates. (Author)

National Bureau of Standards, Boulder, Colo.
BIBLIOGRAPHY OF TROPOSPHERIC RADIO WAVE SCATTERING, by Richard L. Abbott. Nov 60, 82p. 681 refs. Technical note no. 80.
Order from OTS $2.25 PB 161 581

This bibliography emphasizes tropospheric scattering of radio waves by turbulence-induced inhomogeneities of the dielectric constant (local wave velocity in the atmosphere). Papers on related topics such as turbulence theory and measurements, statistics, instrumentation, and some papers on sound scattering are also included. Papers on radio meteorology are generally excluded, unless they bear directly on the reduction of scattering data. This bibliography covers material up to about January 1960. Some recent publications are missing because of the time lag between the dates of journals and their receipt, or because laboratory reports of various organizations often reach other laboratories after a year or more. Some internal reports cannot be listed until they become formal publications. Papers are ordered by year of publication and indexes by author and subject are included. Generally, publications on the same topic will be found close together in the body of the bibliography. (Author)

National Bureau of Standards, Boulder, Colo.
THE NBS METEOR-BURST PROPAGATION PROJECT. A PROGRESS REPORT, by Charles E. Hornback, Louis D. Breyfogle, and George R. Sugar. Rept. on Contracts DO (33-616) 58-16 and CSO&A 59-524. 31 Mar 60, 46p. 8 refs. Technical note no. 86.
Order from OTS $1.25 PB 161 587

This report briefly describes a meteor-burst propagation-study program and presents some of the preliminary analysis results. Observations have been made with scaled systems over three different paths (Long Branch - Table Mesa, Norman - Fargo, and Barrow - Kenai) at frequencies of 30, 50, and 74 Mc/s. The recorded data is processed by a combination of manual and automatic methods. The preliminary results show about a 10 db diurnal variation in threshold for a constant duty-cycle. Thresholds for a constant duty-cycle were observed to have an approximate frequency dependence relative to 30 Mc/s of 15 db lower for 50 Mc/s and 30 db lower for 74 Mc/s. There was no statistically-significant difference observed in the occurrence of meteor-bursts from a Poisson distribution. (Author)

National Bureau of Standards, Boulder, Colo.
A THEORETICAL STUDY OF SPORADIC-E STRUCTURE IN THE LIGHT OF RADIO MEASUREMENTS, by Kazuhiko Tao. Jan 61, 42p. 31 refs. Technical note no. 87.
Order from OTS $1.25 PB 161 588

The theoretical aspects of the mechanisms of sporadic-E reflections are described from both the standpoint of a thin layer and a scattering model. For the thin layer model, thin dielectric layers which have various distributions of electron density are considered. The scattering theory for which an autocorrelation function of the fluctuation of electron density is given by modified Bessel functions of the

fourth through the seventh order is an available model for sporadic-E scatter. Blobs of ionization which have a horizontal scale of the order of 200 m and a vertical scale of about 50 m are considered for sporadic-E scatter. The frequency and distance dependences of the oblique VHF propagation by means of the sporadic-E layer are discussed by comparing the theoretical results with experimental evidence. (Author)

National Bureau of Standards, Boulder, Colo.
VHF RADIO PROPAGATION DATA FOR THE CEDAR RAPIDS-STERLING, ANCHORAGE-BARROW, AND FARGO-CHURCHILL TEST PATHS APRIL 1951 THROUGH JUNE 1958, by George R. Sugar and Kenneth W. Sullivan. 1 Sep 60, 262p. 5 refs. Technical note no. 79.
Order from OTS $4.00 PB 161 580

The data tabulated herein are primarily the hourly values of system loss for vhf ionospheric scatter propagation (D-region scatter) over the test paths. These data do not include all of the measurements made over these test paths, but represent a homogeneous set of results which can be readily intercompared since they were all made under similar experimental conditions. A secondary result of the observing program was the collection of data on sporadic-E propation at 49.8 Mc/s over the Cedar Rapids to Sterling path for other frequencies and other paths have not been included since they cover much shorter intervals of time and the criteria used in scaling were not the same as those used for the 49.8 Mc/s Cedar Rapids - Sterling E_s data.

Physical Research Lab., Space Tech. Labs., Inc., Los Angeles, Calif.
THEORY OF ELECTRON DRIVEN SHOCK WAVES, by R. G. Fowler and B. D. Fried. 16 Sep 60, 17p. 8 refs. STL/TR-60-0000-GR310.
Order from LC mi$2.40, ph$3.30 PB 153 464

Previous calculations of the time required for ion heating in the discharge or driver section of an electrical shock tube yielded values much greater than that in which formation and acceleration of the first luminous front is observed to occur. The model of an electron driven shock presented here shows that the relation between shock velocity, V, and electron temperature, T_e, which has been established experimentally over a wide range of parameters, remains valid even though the conventional picture of a shock driven by hot ions must be abandoned. Thermal expansion of the hot electron gas accelerates the cold ions, resulting in a shock front or moving electrostatic double layer. Assuming conditions behind the shock to be coupled to those in the discharge region through a simple rarefaction wave, it is found that MV^2/kT_e is a universal function of W/MV^2, where W is the effective ionization potential. This is shown to be in excellent agreement with a wide variety of experimental data.

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

Case Inst. of Tech., Cleveland, Ohio.
A BOUNDED SOLUTION TO A LINEAR DIFFERENTIAL EQUATION WITH A TIME-VARYING COEFFICIENT, by Haim Haskal. Scientific rept. no. 18 on Contract AF 19(604)3887. 30 Oct 60, 37p. 2 refs. AFCRL-TN-60-1139; AD-248 954.
Order from LC mi$3.00, ph$6.30 PB 153 876

A linear circuit containing a time varying element is analyzed. A method is devised to bound within prescribed limits the solution of the first order differential equation, the circuit current obeys. The steady-state solution of the current is piecewise given in terms of exponential functions over intervals selected to meet accuracy requirements. The transient component of the current is evaluated within the same limits. A formula is also derived for the steady state direct current component. (Author)

Cook Research Labs., Morton Grove, Ill.
HYDRAULIC SERVO CONTROL VALVES. PART 5. ANALOG SIMULATION, PRESSURE CONTROL, AND HIGH-TEMPERATURE TEST FACILITY DESIGN, by Leslie R. Axelrod, Delmar R. Johnson and Wayne L. Kinney. Rept. on Contract AF 33(616)5136. Aug 58, 148p. WADC Technical rept. 55-29, Part V; AD-208 266.
Order from LC mi$7.20, ph$22.80 PB 154 966

This report released for sale to the public 16 Mar 61.

Analog computer simulation of an electrohydraulic servo valve, investigation of pressure control valves, and design of a high-temperature test facility are discussed. Analytical relations are developed which describe the internal nonlinear operations of the valve These equations are mechanized on an analog computer and the results verified for static conditions. The advisability of using a pressure control valve as opposed to a flow control valve in closed loop operation is investigated. The development of a pressure control valve transfer function and experimental verification of the analytical results is included. The requirements for a valve testing facility capable of providing and utilizing oil at 750°F, and an ambient temperature up to 1200°F, are presented.

Massachusetts Inst. of Tech., Cambridge.
GQS. GENERAL SINGLE-SERVER QUEUE-SIMULATION COMPILER, by George W. Armerding. Interim technical rept. no. 15 on Fundamental Investigations in Methods of Operations Research, Contract DA 19-020-ORD-2684. July 60, 61p. 17 refs. OOR rept. 968.30-M; AD-243 492.
Order from LC mi$3.90, ph$10.80 PB 153 681

A description is given of GQS, a general queue-simulation compiler program constructed for the IBM 704 computer. The compiler generates a simulation

program for any one of a number of specifiable single-server queuing operations. Inter-arrival times at each of a number of queues may be exponential, erlang, hyperexponential, normal, rectangular or constant, and these distributions may be assigned non-stationary parameters. Service-times may be chosen from any of these distributions, also with non-stationary parameters, and service-times may be compounded through probabilistic chains. Priority of service may be assigned by input queue. (Author)

Rome Air Development Center, Griffiss AFB, N. Y.
THE EFFECT OF HIGH AND LOW-PASS FILTERING ON SPEECH INTELLIGIBILITY, by Arthur Rubin, R. J. Christman, and George E. Renaud. Nov 60, 11p. 6 refs. RADC-TN-60-243; AD-249 025.
Order from LC mi$2.40, ph$3.30 PB 153 871

This report describes an experiment on speech filtering. Speech, consisting of prerecorded, phonetically-balanced word lists, was passed through either High-Pass or Low-Pass filters at various cut-off frequencies, and delivered through calibrated headphones to trained listeners. Five subjects listened to the filtered speech and were scored for number of words heard correctly. Data are presented in both tabular and curve form, showing the amount of intelligibility remaining for various degrees of frequency restriction. Some intelligibility may remain in the speech signal when severe bandwidth limitations are imposed. Extreme bandwidth restriction results in loss of (Research Methods, Techniques and Equipment, "naturalness" and leads to possible difficulty in speaker recognition. One-half the presently utilized military voice channel bandwidth can result in usable communications. (Author)

Communication Theory

Ohio State U. Research Foundation, Columbus, Ohio.
ONE-SYLLABLE WORDS-REVISED AND ARRANGED BY ENDING SOUNDS, by Henry M. Moser. Technical rept. no. 53 on Contract AF 19(604)4575. Nov 60, 153p. 1 ref. RF proj. 882; AFCCDD-TN-60-58; AD-248 933.
Order from LC mi$7.50, ph$24.30 PB 153 875

This report presents a systematic listing of the monosyllabic words in American English according to their ending sounds. It represents a complete revision of One-syllable Words, AFCRC TN-55-56 (PB 132 061) in that all words have been re-examined, errors have been corrected, a few words have been deleted, and a number of new words have been added. The summary charts have been revised, and charts of the beginning and ending sounds with the individual vowels and diphthongs have been added. Some changes have been made in the section on Inclusions, Exclusions, and Qualifications. For the most part, the two reports supplement each other; the earlier report presents an arrangement according to beginning consonant sounds, the present work according to ending sounds. (Author)

Parke Mathematical Labs., Inc., Carlisle, Mass.
AN EXTENSION OF KAUTZ'S WORK ON ERROR-CORRECTING CODES, by Hans G. Haefeli. Scientific rept. no. 4 on Contract AF 19(604)3471. Sep 60, 36p. 3 refs. AFCRL-TN-60-1118. AD-248 307.
Order from LC mi$3.00, ph$6.30 PB 153 654

Proofs of some basic theorems concerning binary and non-binary Kautz's codes. Most of the results had been conjectured by Kautz for the binary case. (Author)

Photographic Equipment

Hydel, Inc., Waltham, Mass.
THE DEVELOPMENT OF A PHOTOMEMORY, by Emery St. George, Jr., Carl E. Nielsen, Jr. and Eugene P. Johnson, Jr. Annual summary rept. no. 1 on Contract Nonr-2668(00). [1960] 106p. 13 refs. AD-237 635.
Order from LC mi$5.70, ph$16.80 PB 147 756

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(Research Methods--Photographic Equipment,
Writing system development
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  Data input

Systems Development Corp., Dayton, Ohio.
A METHOD FOR CALCULATING FILM RESPONSE TO CATHODE RAY TUBE PHOSPHORS, by John E. Miller. Rept. on Contract AF 33(600)36195. June 59, 22p. WADC Technical note 59-97; AD-212 910.
Order from LC mi$2.70, ph$4.80 PB 154 752

This report released for sale to the public 15 Mar 61.

This report discusses the theoretical optimization of film and phosphor combinations as used in cathode ray tube photography. A means is derived whereby the radiant flux energy from a phosphor can be converted to a given density on the developed film. This method of conversion can be used to obtain a figure of merit for any film-phosphor combination. Several films and phosphor combinations are theoretically evaluated and comparative figures of merit are tabulated. A conversion between the units of meter candle seconds and watt seconds is obtained. The expression for the

beam current density in a cathode ray tube is obtained as a function of the radar resolution capabilities, the camera lens, and the required density on the developed film. This beam current density is compared to the Langmuir limit for beam current densities in cathode ray tubes. A means of specifying resolution is suggested. Experimental results when available will be published. (Author)

SOCIAL SCIENCES

Applied Mathematics and Statistics Labs., Stanford U., Calif.
WALRAS' EXISTENCE THEOREM AND BROUWER'S FIXED-POINT THEOREM, by Hirofumi Uzawa. Technical rept. no. 80 on Contract Nonr-225(50). 28 Mar 60, 7p. 12 refs. AD-235 144.
Order from LC mi$1.80, ph$1.80 PB 153 691

The equivalence of two fundamental theorems, Walras' existence theorem and Brouwer's fixed-point theorem, is shown. Walras' theorem is concerned with the existence of an equilibrium in the Walrasian system of general equilibrium. Let an excess demand function x(p) satisfy the following conditions: (1) x(p) is a continuous mapping from P into X, (2) x(p) is a homogeneous of order 0: $x(tp) = x(p)$ for all $t > 0$ and $p \in P$, and (3) Walras' law holds: $\sum_{i=1}^{n} p_i x_i(p) = 0$ for all $p \in P$. Then there exists at least an equilibrium price vector $\bar{p}$ for x(p). Brouwer's theorem is concerned with a continuous mapping on the simplex. Set $\phi(\pi)$ be a continuous mapping from π into itself. Then there is at least a fixed-point $\bar{\pi}$ in π: $\bar{\pi} = \phi(\bar{\pi})$.

California U., Los Angeles.
PRIORITY FUNCTION METHODS FOR JOB-LOT SCHEDULING, by Ross T. Nelson. Rept. on Management Sciences Research Proj. [Contract Nonr-233(02). 4 Feb 55, 37p. Discussion paper no. 51; AD-147 553.
Order from LC mi$3.00, ph$6.30 PB 154 423

This report released for sale to the public 8 Mar 61.

The research reported in this paper was directed toward the development of computationally feasible methods for obtaining approximations to the solutions of certain job-lot scheduling problems.

Northwestern Technological Inst., Evanston, Ill.
INTER-TEMPORAL ANALYSIS AND OPTIMIZATION OF BANK PORTFOLIOS, by D. Chambers and A. Charnes. ONR Research memo. no. 27 on Temporal Planning and Management Decision under Risk and Uncertainty, Contract Nonr-1228(10). May 60, 30p. 3 refs. AD-237 868.
Order from LC mi$2.70, ph$4.80 PB 148 198

A model is presented and illustrated for assisting in the analysis and planning of a bank's portfolio over several time periods. The banker is assumed to know the levels that will prevail, at various dates in the future, of demand and time deposits, of rates of interest, and of the bank's net worth. The banker seeks to maximize profit. He has a choice between various kinds of earning asset (loans, government securities, bonds issued by agencies other than the government), and for each kind of asset he also has a choice between several maturities. He is required to observe two restrictions: a reserve requirement that part of the bank's assets must be held in cash or deposited with the Federal Reserve, and a constraint that it maintain a balanced portfolio. (Author)

Princeton U., N. J.
UNCERTAINTY AND THE EXPANSION OF BANK CREDIT, by Daniel Orr and Walter G. Mellon. Rept. on Contract Nonr-1858(16). 1 Nov 59, 14p. 18 refs. Econometric Research Program Research Memo. no. 10.
Order from LC mi$2.40, ph$3.30 PB 150 469

The method of treatment suggested by Edgeworth (Jnl. of The Royal Statistical Society 51: 113-127, 1888) is developed and extended to the banking system as a whole. When the results of this analysis are compared with those obtained in the traditional Phillips formulation, it will be shown that the expansion of bank credit, though appreciably affected, is surprisingly insensitive to the presence of uncertainty, at least of the type visualized. This result is hardly obvious a priori in view of the substantial differences between stochastic and deterministic analyses of the inventory problem.

Documentation

Case Inst. of Tech., Cleveland, Ohio.
AN OPERATIONS RESEARCH STUDY OF THE DISSEMINATION AND USE OF RECORDED SCIENTIFIC INFORMATION IN THREE PARTS: I. JOURNAL READING BY PHYSICISTS AND CHEMISTS. II. THE COST OF JOURNAL PUBLICATION. III. THE EFFECT OF CONDENSATION ON COMPREHENSION OF JOURNAL ARTICLES. Rept. on National Science Foundation Grant no. G-8434. Dec 60, 74p.
Order from OTS $2.00 PB 171 503

An intensive study of the reading behavior of chemists and physicists was made using almost exclusively the direct observation of behavior (rather than questionnaires, interviews, or diaries) to determine what is read, why they read what they do, and what differences in reading behavior exist between the groups. An economic analysis of journal publication was made and an equation developed which expresses the average cost (and range of costs) of publishing journals of a certain type as a function of the characteristics of the journal. In addition, by combining the cost estimates with readership data, estimates of cost per reading (rather than cost per page printed) were made for the most frequently read journals in the fields and they were compared on this basis. The third part of the study is directed to the question of how condensation affects the comprehension of scientific articles. A pilot study was run to determine the feasibility of a given experimental design to establish the effect of condensation. (Author)

Remington Rand Univac Div., Sperry Rand Corp., Philadelphia, Pa.
THE SCAN-COLUMN INDEX. A BOOK-FORM COORDINATE INFORMATION RETRIEVAL SYSTEM, by John O'Connor. Rept. on Contract Nonr-2297(00). Feb 60, 84p. 25 refs. AD-236 466.
Order from LC mi$4.80, ph$13.80 PB 153 160

The book-form index requires no searching machine, and the coordinate searching can be done by a clerical person. Each document is entered at just one place, and the documents can be in almost any order. A document entry consists of a single (or multi-) character abbreviation for each term the document possesses, and a document identification. The document identification may be anything from a serial number to a brief abstract; micro-reduced document identifications are also discussed. Speed of searching might be anywhere from several hundred to one thousand or perhaps more documents per minute, depending to a considerable extent on the amount of space used. However, actual searching speeds are best determined in particular applications. Some factors likely to be relevant to search speed are discussed. Specimen pages of a hypothetical scan-column index are given for reader trials, and experiences of several people with them are discussed. There is a chance of error in searching, and fatigue limits the amount of searching possible. These factors are discussed. Subsearches are defined, their importance described, and their performance in a scan-column index and in other nonmechanized systems are discussed. Various questions about producing a scan-column index are discussed. A number of possible applications for the scan-column index are suggested. Several possible variations of the scan-column form are suggested, including a very modestly mechanized retrieval system, and a possibly convenient arrangement for coordinate searching of microfilm reels. (Author)

MISCELLANEOUS

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS. Apr 61.
Order from OTS $1.25, $10.00/year PB 171 317

Contents:
Articles:
The Elevated Duct Between San Diego and Hawaii—Wave Propagation Branch Staff
A Brief Review and Analysis of Thermoelectricity, by W. H. Lucke
Scientific program:
Chemistry: Surface chemical methods of displacing water and/or oils and salvaging flooded equipment—some practical applications
Mechanics: Effect of dimensions on fast fracture instability of notched specimens. New technique facilitates evaluation of the fracture toughness of sheet materials
Metallurgy and Ceramics: Crack propagation resistance of aus-rolled low alloy steel. Calibration of new electron microscope for selected area diffraction. Effect of cold work and temperature on the strength and structure of steel. Effect of prior creep in controlled environments on the low temperature tensile strength of nickel. Removal of interstitial impurities from niobium by zinc-niobium compounds. Determination of alkali metals in solid propellant rocket fuels. Cast HY 80 as a submarine structural material. Protective spinel films on steel: Their corrosion resistance in aqueous media at room temperature. Preliminary findings in a final investigation of the effect of minor constituents on the performance of zinc anodes in sea water
Optics: Effect of glare on eye behavior during growth of dark adaptation under blackout conditions
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Sound: Effect of hydrostatic pressure on seven types of magnetic core materials

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General, Miscellaneous, and Progress Reports

Chemical processing technology. Quarterly progress report for April - June 1960, by J. R. Huffman and others. Phillips Petroleum Company, Atomic Energy Division, Idaho Falls, Idaho. Dec 60. Contract AT(10-1)-205. 87p. Order from OTS. $2.00. IDO-14534

Range safety considerations of the Deacon-Arrow sounding rocket, by C. T. Force. Sandia Corporation, Albuquerque, N. Mex. Jan 61. 113p. Order from OTS. $2.50. SC-4513 (RR)

High explosives, arming and firing, project HOBO, by R. J. Tockey. Sandia Corporation, Livermore Laboratory, Livermore, Calif. Aug 60. 29p. Order from LC. Mi $2.70, ph $4.80. SC-4824 (RR)

Biology and Medicine

Medical survey of Rongelap people five and six years after exposure to fallout (with an addendum on vegetation), by R. A. Conard and others. Brookhaven National Laboratory, Upton, N. Y. Sep 60. 86p. Order from OTS. $2.00. BNL-609(T-179)

Radioisotopic cows, by W. D. Tucker. Brookhaven National Laboratory, Upton, N. Y. 1960. 10p. Order from LC. Mi $1.80, ph $1.80. BNL-4908

Biological effectiveness of nuclear radiations from fission weapons, by P. S. Harris. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Aug 55. Decl. with deletions November 25, 1959. 51p. Order from LC. Mi $3.60, ph $9.30. LA-1937(Del.)

Metabolism of C^{14} -isoniazid in humans, by I. U. Boone and others. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Mar 60. Contract W-7405-eng-36. 50p. Order from LC. Mi $3.30, ph $7.80. LA-2420

Effect of segmental gut shielding on mortality from intestinal radiation, by J. C. Smith. Western Reserve University, Atomic Energy Medical Research Project, Cleveland, Ohio. Oct 59. Contract W-31-109-Eng-78, 21p. Order from LC. Mi $2.70, ph $4.80. NYO-2064

Final progress report for March 1, 1959 - May 31, 1960, by E. C. Pollard. Yale University, New Haven, Conn. 1960. Contract AT(30-1)-568. 58p. Order from LC. Mi $3.60, ph $9.30. NYO-9339

The study of spontaneous and induced genetic changes in mammalian cells grown in tissue cultures. Summary report for period June 15, 1958 to June 14, 1960, by H. Moser. Long Island Biological Association, Biological Laboratory, Cold Spring Harbor, N. Y. 1960. Contract AT(30-1)-1944. 29p. Order from LC. Mi $2.70, ph $4.80. NYO-9396

The effects of radiations and chemical treatment on growth in phleum pratense roots. Progress report, by R. T. Brumbield. Longwood College, Farmville, Va. 1960. Contract AT(40-1)-1676. 17p. Order from LC. Mi $2.40, ph $3.30. ORO-280

The effects of radiations and chemical treatment on growth in phleum pratense roots. Progress report, by R. T. Brumfield. Longwood College, Farmville, Va. 1960. Contract AT(40-1)-1676. 25p. Order from LC. Mi $2.70, ph $4.80. ORO-281

The cytology and genetics of radiation resistance in bacteria. Progress report for the period of February 1, 1955 to November 1, 1955. University of Oklahoma, Research Institute, Norman, Okla. 1955. Contract AT(40-1)-1976. 50p. Order from LC. Mi $3.30, ph $7.80.
ORO-282

The cytology and genetics of radiation resistance in bacteria. Progress report for the period of November 1, 1955 to November 1, 1956. University of Oklahoma, Research Institute, Norman, Okla. 1956. Contract AT(40-1)-1976. 49p. Order from LC. Mi $3.30, ph $7.80.
ORO-283

The cytology and genetics of radiation resistance in bacteria. Progress report for the period of November 1, 1956 to November 1, 1957. University of Oklahoma, Research Institute, Norman, Okla. 1957. Contract AT(40-1)-1976. 44p. Order from LC. Mi $3.30, ph $7.80.
ORO-284

The cytology and genetics of radiation resistance in bacteria. Progress report for the period of November 1, 1957 to November 1, 1958. University of Oklahoma, Research Institute, Norman, Okla. 1958. Contract AT(40-1)-1976. 31p. Order from LC. Mi $2.70, ph $4.80.
ORO-285

The relationship of skin conductance to behavior in a vigilance task, by D. Stea. Sandia Corporation, Albuquerque, N. Mex. Jan 61. 51p. Order from OTS. $1.50. SCTM-331-60-14

Radioisotopes in agriculture: Animal husbandry, fertilizer uptake, plant physiology, photosynthesis, and entomology. A selected bibliography, by J. A. McCormick and H. E. Voress. Office of Technical Information, Oak Ridge, Tenn. Dec 60. 35p. Order from OTS. $1.00.
TID-3078

Vascular and tissue alterations induced by whole body x-irradiation. Progress report 1959 - 1960, by B. W. Zweifach and E. Kivy-Rosenberg. New York University, Medical Center, New York, N. Y. May 60. Contract AT(30-1)-1680. 6p. Order from LC. Mi $1.80, ph $1.80.
TID-5946

Biological effects of radiation, and related biochemical and physical studies. Semiannual progress report for November 1, 1959 through April 30, 1960. Sloan-Kettering Institute for Cancer Research, New York, N. Y. May 60. Contract AT(30-1)-910. 70p. Order from LC. Mi $3.90, ph $10.80. TID-5955

Investigations on the cytogenetic effects of radiation. Progress report for June 1, 1959 to May 31, 1960. Yale University, New Haven, Conn. 1960. Contract AT(30-1)-872. 48p. Order fo from LC. Mi $3.60, ph $9.30. TID-5976

The influence of radiation in altering the incidence of mutations in drosophila. Progress report on the past twelve months and renewal proposal for the period September 15, 1960 to September 14, 1961, by H. J. Muller. Indiana University, Foundation Research Division, Bloomington, Ind. May 60. Contract AT(11-1)-195. 14p. Order from LC. Mi $2.40, ph $3.30. TID-6042

Some effects of oxygen on the insects, anagasta kuehniella and tenebrio molitor, by A. M. Clark and V. J. Cristofalo. University of Delaware, Newark, Dela. and Oak Ridge National Laboratory, Oak Ridge, Tenn. 1959. Contract AT(30-1)-1752. 20p. Order from LC. Mi $2.40, ph $3.30. TID-6052

A program for the study of transplantation of bone marrow, tissues, and whole organs and of related topics in surgical research. Progress report with outline of continuning work, by F. D. Moore. Harvard University, Medical School, Boston, Mass. June 60. Contract AT(30-1)-2265. 28p. Order from LC. Mi $2.70, ph $4.80. TID-6107

The effect of prenatal x-irradiation on the behavioral development of the albino rat. Period covered October 1, 1959 through September 30, 1960, by J. Werboff and M. R. Sikov. Wayne State University, Aninal Behavior Laboratory, Detroit, Mich. 1960. Contract AT(11-1)-821. 15p. Order from LC. Mi $2.40, ph $3.30.
TID-6147

The cause and nature of an aplastic anemia of the bovine and its relation to radiation pancytopenia. Progress report no. 5 covering the period June 16, 1959 to June 15, 1960, by M. O. Schultz and J. H. Sautter. University of Minnesota, St. Paul, Minn. 1960. Contract AT(11-1)-364. 56p. Order from LC. Mi $3.60, ph $9.30.
TID-6152

Uptake, transport, and effects of radioactive materials in aquatic ecosystems. Progress report. University of Michigan, Ann Arbor, Mich. 1959. Contract AT(11-1)-781. 5p. Order from LC. Mi $1.80, ph $1.80. TID-6153

Immunochemical studies of radiation-induced damage to biological systems. Technical progress report no. 4 for May 16, 1959 through April 30, 1960, by C. A. Leone. University of Kansas,

Lawrence, Kan. May 60. Contract AT(11-1)-83. 72p. Order from LC. Mi $4.50, ph $12.30. TID-6156

Report of progress for period covered: July 1, 1959 to May 31, 1960, by G. Pincus. Worcester Foundation for Experimental Biology, Shrewbury, Mass. June 60. Contract AT(30-1)-918. 16p. Order from LC. Mi $2.40, ph $3.30. TID-6183

The chemistry of boron in plants. Technical progress report. State University of Iowa, Iowa City, Iowa. [nd]. Contract AT(11-1)-59. 7p. Order from LC. Mi $1.80, ph $1.80. TID-6160

Ca-45 and Sr-85 metabolism in man. Progress report for June 15, 1959-May 20, 1960. Creighton University, Omaha, Neb. 1960. Contract AT (11-1)-587. 9p. Order from LC. Mi $1.80, ph $1.80. TID-6219

Effects of X-rays and thermal neutrons on plant metabolism. Final report, by F. A. Haskins. University of Nebraska, Lincoln, Neb. 1960. Contract AT(11-1)-393. 32p. Order from LC. Mi $3.00, ph $6.30. TID-6264

The effect of localized x-irradiation on antibody formation and antigen localization. The site of antibody formation. Final report for June 1, 1959 to June 30, 1960, by W. H. Taliaferro. University of Chicago, Chicago, Ill. 1960. Contract AT(11-1)-175. 30p. Order from LC. Mi $3.00, ph $6.30. TID-6349

Studies on hydrogen oxidation in cell-free extracts of hydrogeneomonas eutropha. Final technical report for September 1954 to August 1959, by C. L. Wittenberger and R. Repaske. University of Indiana, Bloomington, Ind. 1959. Contract AT(11-1)-251. 30p. Order from LC. Mi $2.70, ph $4.80. TID-6394

Radioisotope exchange studies in lakes. Progress report for February 1960 - January 1961. University of Wisconsin, Madison, Wis. 1961. Contract AT(11-1)-64. 26p. Order from LC. Mi $2.70, ph $4.80. TID-6513

Integration of the genotype in geographic populations of drosophila pavani, by D. Brncic. Chile. Universidad, Santiago and Chile. Universidad, Santiago. Instituto de Biologia "Juan Noe." 1958. Contract AT(30-1)-2465. 13p. Order from LC. Mi $2.40, ph $3.30. TID-6539

A quantitative study of lifetime sickness and mortality and progeny effects resulting from exposure to penetrating irradiation. Summary of progress and contemplated work program, 1960-1961, by J. W. Gowen and J. Stadler. Iowa State University of Science and Technology, Ames, Iowa. 1961. Contract AT(11-1)-107. 122p. Order from LC. Mi $6.30, ph $19.80. TID-6582

The application of nuclear energy to agriculture. Quarterly report. Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica. 1960. Contract AT(30-1)-2043. 47p. Order from LC. Mi $3.30, ph $7.80. TID-6594

Physiological studies on congenital deformity in mice. Mechanism of action of radiation and radiomimetic treatments. Progress report and sixth renewal proposal for September 1, 1959 to August 31, 1960, by C. P. Dagga and M. N. R Runner. Roscow B. Jackson Memorial Laboratory, Bar Harbor, Me. Oct 60. Contract AT (30-1)-1762. 23p. Order from LC. Mi $2.70, ph $4.80. TID-6615

Uptake of radioisotopes and their transfer through food chains by marine organisms. Annual report, 1959-1960, by S. J. Townsley and others. University of Hawaii, Hawaii Marine Laboratory, Honolulu, Hawaii. 1960. Contract AT(04-3)-56. 45p. Order from LC. Mi $3.30, ph $7.80. TID-6630

Genetic effects of cumulative irradiation in rats. Technical progress report, by A. B. Chapman and others. University of Wisconsin, Madison, Wis. Sep 59. Contract AT(11-1)-697. 4p. Order from LC. Mi $1.80, ph $1.80. TID-6640

Relation of rickettsial and viral infections to radiation injury. Progress report and pooposed program for period January 1, 1960 to December 31, 1960, by D. Greiff. Marquette University, School of Medicine, Milwaukee, Wis. Oct 60. Contract AT(11-1)-596. 53p. Order from LC. Mi $3.60, ph $9.30. TID-6729

Rate of recovery from radiation injury and its relationship to after expectation of life of mice. Progress report for January 1, 1960 to September 20, 1960. Renewal period: January 1, 1961 to December 31, 1961, by J. B. Storer. Roscoe B. Jackson Memorial Laboratory, Bar Harbor, Me. Sep 60. Contract AT(30-1)-2313. 16p. Order from LC. Mi $2.40, ph $3.30. TID-6743

A study of strontium, calcium, and rare earths metabolism in humans. Annual report for December 1, 1959 to November 30, 1960. Application for the continuation of work for December 1, 1960 to November 30, 1961, by H. Spencer. Montefiore Hospital, New York, N.Y. Oct 60. Contract AT(30-1)-1763. 67p. Order from LC. Mi $3.90, ph $10.80. TID-6747

The bacteriological aspects of radiation sickness, by C. P. Miller. University of Chicago, Chicago, Ill. 1959. Contract AT(11-1)-46. 18p. Order from LC. Mi $2.40, ph $3.30. TID-6855

Radiation induced viability mutations in the honey bee, by W. R. Lee. University of New Hampshire, Durham, N. H. 1959. Contract AT (30-1)-2315. 3p. Order from LC. Mi $1.80, ph $1.80. TID-6877

Summary statement of findings related to the distribution, characteristics, and biological availability of fallout debris originating from testing programs at the Nevada test site, by K. H. Larson and J. W. Neel. University of California, School of Medicine, Los Angeles, Calif. Sep 60. Contract AT-04-1-GEN-12. 40p. Order from LC. Mi $3.00, ph $6.30. UCLA-438

Current status of curium inhalation exposures in humans, by H. G. Parker and others. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. Sep 60. Contract W-7405-eng-48. 12p. Order from LC. Mi $2.40, ph $3.30. UCRL-9361

Comparative effects of glucagon, hydrocoritisone and epinephrine on the protein metabolism of the fasting rat, by J. L. Izzo and others. University of Rochester, Atomic Energy Project, Rochester, N. Y. May 58. Contract W-7401-eng-49. 26p. Order from LC. Mi $2.70, ph $4.80. UR-564

Distribution and excretion studies in dogs exposed to an aerosol containing polonium-210, by F. A. Smith and others. University of Rochester, Atomic Energy Project, Rochester, N. Y. Jan 60. Contract W-7401-eng-49. 45p. Order from LC. Mi $3.30, ph $7.80. UR-566

High specific activity iodination of gamma-globulin with iodine-131 monochloride, by R. W. Helmkamp and others. University of Rochester, Atomic Energy Project, Rochester, N. Y. Mar 60. Contract W-7401-eng-49. 18p. Order from LC. Mi $2.40, ph $3.30. UR-568

Billary excretion of radium in dogs, by J. B. Hursh and A. Lovaas. University of Rochester, Atomic Energy Project, Rochester, N. Y. May 60. Contract W-7401-eng-49. 16p. Order from LC. Mi $2.40, ph $3.30. UR-571

Urinary excretion of radium in dogs, by J. B. Hursh and others. University of Rochester, Atomic Energy Project, Rochester, N. Y. May 60. Contract W-7401-eng-49. 17p. Order from LC. Mi $2.40, ph $3.30. UR-572

Unifying concepts of parathyroid hormone action, by A. R. Terepka and others. University of Rochester, Atomic Energy Project, Rochester, N. Y. July 60. Contract W-7401-eng-49. 28p. Order from LC. Mi $2.70, ph $4.80. UR-577

Strontium-90 and gross beta activity in the fat and non-fat fractions of coconut crab (Birgus latro) liver collected at Rongelap Atoll during March 1958, by D. Chakravarti and R. Eisler. University of Washington, Laboratory of Radiation Biology, Seattle, Wash. Mar 59. Contract AT (45-1)-540. 13p. Order from LC. Mi $2.40, ph $3.30. UWFL-59

Potassium as an index of naturally occurring radioactivity in tuna muscle , by D. Chakravarti and T. Joyner. University of Washington, Laboratory, of Radiation Biology, Seattle, Wash. June 59. Contract AT(45-1)-540. 11p. Order from LC. Mi $2.40, ph $3.30. UWFL-60

Potassium and cesium-137 in birgus latro (coconut crab) muscle collected at Rongelap Atoll, by D. Chakravarti and E. E. Held. University of Washington, Laboratory of Radiation Biology, Seattle, Wash. Jan 60. Contract AT(45-1)-540. 14p. Order from LC. Mi $2.40, ph $3.30. UWFL-64

The analysis of some trace elements in fish tissues, by T. Joyner and D. Chakravarti. University of Washington, Laboratory of Radiation Biology, Seattle, Wash. Apr 60. Contract AT(45-1)-540. 15p. Order from LC. Mi $2.40, ph $3.30. UWFL-68

Chemical Separations Processes for Plutonium and Uranium

Purification of reactor fuels using liquid zinc, by J. B. Knighton and others. Argonne National Laborarory, Argonne, Ill. Jan 61. Contract W-31-109-eng-38. 35p. Order from OTS. 75 cents. ANL-6223

Chemical engineering division summary report for July, August, September, 1960, by S. Lawroski and others. Argonne Natinnal Laboratory, Argonne, Ill. 1960. Contract W-31-109-eng-38. 182p. Order from OTS. $2.75. ANL-6231

Engineering evaluation of volatility pilot plant equipment, by F. W. Miles and W. H. Carr. Oak Ridge National Laboratory, Oak Ridge, Tenn. Sep 60. 393p. Order from LC. Mi $11.10, ph $63.00. CF-60-7-65

Eurochemic assistance program. Progress report for January through June 1960, by E. L. Nicholson and E. M. Shank. Oak Ridge National Laboratory, Oak Ridge, Tenn. July 60. 6p. Order from LC. Mi $1.80, ph $1.80. CF-60-8-2

Eurochemic assistance program: Information from Hapo on centrifuge decontamination and fuel storage canal water clean-up, by O. F. Hill. Oak Ridge National Laboratory, Oak Ridge, Tenn. Aug 60. 3p. Order from LC. Mi $1.80, ph $1.80. CF-60-8-127

Distribution of uranyl nitrate between $Al(NO_3)_3$ and tributyl phosphate, by D. P. Ames and D. G. Karraker. Du Pont de Nemours (E. I.) & Company, Savannah River Laboratory, Aiken, S. C. Mar 58. Decl. March 28, 1960. Contract AT (07-2)-1. 16p. Order from LC. Mi $2.40, ph $3.30. DP-275

Scavenging of ruthenium from Purex uranyl nitrate solution, by C. A. Prohaska. Du Pont de Nemours (E. I.)& Company, Savannah River Laboratory, Aiken, S. C. June 58. Decl. March 28, 1960. Contract AT(07-2)-1. 12p. Order from LC. Mi $2.40, ph $3.30. DP-296

Behavior of technetium in the Purex process, by T. H. Siddall, III. Du Pont de Nemours (E. I.) & Company, Savannah River Laboratory, Aiken, S. C. Apr 59. Decl. March 28, 1960. Contract AT(07-2)-1. 13p. Order from LC. Mi $2.40, ph $3.30. DP-364

Recovery of rare earth fission products from Purex waste, by W. E. Prout and E. K. Dukes. E. I. du Pont de Nemours & Company, Savannah River Laboratory, Aiken, S. C. Sep 60. Contract AT(07-2)-1. 16p. Order from OTS. 50 cents. DP-509

Complexing fluoride ions with aluminum metal, by R. A. Holthaus and others. Goodyear Atomic Corporation, Portsmouth, Ohio. Aug 60. Contract AT(33-2)-1. 5p. Order from LC. Mi $1.80, ph $1.80. GAT-P-18

Deposition of ruthenium activity on the oxidizer during head-end treatment, by C. F. Callis. Hanford Works, Richland, Wash. Nov 50. Decl. March 28, 1960. 7p. Order from LC. Mi $1.80, ph $1.80. HW-19391

Organic continuous cartridge for the Purex 2D column, by G. M. Hesson. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Aug 56. Decl. June 10, 1960. Contract W-31-109-Eng-52. 14p. Order from LC. Mi $2.40, ph $3.30. HW-44974

The separation of cerium from the trivalent rare earths using hydrogen peroxide and sodium acetate, by E. J. Wheelwright and N. C. Howard. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. May 60. Contract AT(45-1)-1350. 18p. Order from LC. Mi $2.40, ph $3.30. HW-62505

Multi-purpose dissolver information manual, by H. P. Simonds. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Mar 60. Contract AT(45-1)-1350, 13p. Order from LC. Mi $2.40, ph $3.30. HW-64172

The zirflex process terminal development report, by P. W. Smith. Hanford Atomic Products Operation, Richland, Wash. Sep 60. Contract AT(45-1)-1350. 48p. Order from OTS. $1.25. HW-65979

Review of research and development at the Idaho Chemical processing plant on the electrolytic dissolution of nuclear fuel, by C. M. Slansky and others. Phillips Petroleum Company, Atomic Energy Division, Idaho Falls, Idaho. Jan 61. Contract AT(10-1)-205. 57p. Order from OTS. $1.25. IDO-14535

Some comments on the U^{232} and Th^{228} problems in recycled Th - U fuels, by E. F. Weisner. Atomics International. Division of North American Aviation, Inc., Canoga Park, Calif. June 55. Decl. June 10, 1960. 15p. Order from LC. Mi $2.40, ph $3.30. NAA-SR-Memo-1418

Foam separation in nuclear processing. Annual report for April 1, 1959 to June 15, 1960. Radiation Applications Inc., New York, N. Y. Sep 60. Contract AT(30-1)-2384. 41p. Order from LC. Mi $3.00, ph $6.30. NYO-2521

Purex proeess for plutonium and uranium recovery, by W. B. Lanham and T. C. Runion. Oak Ridge National Laboratory, Oak Ridge, Tenn. Oct 49. Decl. with deletions April 18, 1960. Contract W-7405-eng-26. 11p. Order from LC. Mi $2.40, ph $3.30. ORNL-479 (Del.)

Recovery of nitrogen oxides and rare gas fission products from the nitric acid dissolution of irradiated uranium, by A. T. Gresky. Oak Ridge National Laboratory, Oak Ridge, Tenn. Apr 52. Decl. with deletions February 9, 1960. Contract W-7405-eng-26. 83p. Order from LC. Mi $4.80, ph $13.80. ORNL-1208 (Del.)

Operating characteristics of a podbielniak centrifugal extractor, by J. H. Morgenthaler and others. Massachusetts Institute of Technology, Engineering Practice School, Oak Ridge, Tenn. Aug 51. Delc. March 28, 1960. Contract W-7405-eng-26. 30p. Order from LC. Mi $2.70, ph $4.80. TID-5463

Separation of yttrium and the rare earths by liquid-liquid extraction. Progress report for October 3, 1957 to February 7, 1958, by J. Q. Penrod. Michigan Chemical Corporation, St. Louis, Mich. Apr 58. 14p. Order from LC. Mi $1.80, ph $1.80. TID-6420

Liquid-liquid extraction processes. Period covered April 9-18, 1957, by C. W. Clemons. Michigan Chemical Corporation, St. Louis, Mich. Aug 57. Decl. February 6, 1959. 10p. Order from LC. Mi $1.80, ph $1.80. TID-6424

The separation of the rare earths in a Lindsey concentrate by ion exchange. Period covered June 22, 1956 to March 30, 1957, by R. E. Witman. Michigan Chemical Corporation, St. Louis, Mich. Apg 57. Decl. February 6, 1959. 19p. Order from LC. Mi $2.40, ph $3.30. TID-6430

Longitudinal dispersion in solvent-extraction columns: Numerical tables, by A. K. McMullen, and others. University of California, Radiation Laboratory, Berkeley, Calif. Jan 58. Contract W-7405-eng-48. 31p. Order from LC. Mi $3. Mi $3.00, ph $6.30. UCRL-3911 (Suppl.)

Chemistry

Tritium production process, by N. Chellew and others. Argonne National Laboratory, Argonne, Ill. May 48. Decl. March 15, 1960. Contract W-31-109-eng-38. 25p. Order from LC. Mi $2.70, ph $4.80. ANL-4159

Thermodynamic evaluation of materials in contact with fluoride fuels, by R. C. Crooks and others. Battelle Memorial Institute, Columbus, Ohio. Aug 54. Decl. September 9, 1959. Contract W-7405-eng-92. 19p. Order from LC. Mi $2.70, ph $4.80. BMI-936

Practical methods of milking Y^{90}, Tc^{99m}, and I^{132} from their respective parents, by W. D. Tucker and others. Brookhaven National Laboratory, Upton, N. Y. Aug 60. 4p. Order from LC. Mi $1.80, ph $1.80. BNL-4940

Chemical technology division, unit operation section monthly progress report for January 1958, by J. C. Bresee and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. Aug 58. 41p. Order from LC. Mi $3.00, ph $6.30. CF-58-1-137

Measurements of small amounts of H_2O in D_2O by near-infrared absorption spectroscopy, by R. E. Biggers. Oak Ridge National Laboratory, Oak Ridge, Tenn. Dec 58. 7p. Order from LC. Mi $1.80, ph $1.80. CF-58-12-143

Hydrogen evolution from uranium-233 product solutions, by R. H. Rainey. Oak Ridge National Laboratory, Oak Ridge, Tenn. Mar 60. 9p. Order from LC. Mi 1.80, ph $1.80. CF-60-3-8

Transfer of uranyl ion across a water-TBP interface, by C. V. Chester. Oak Ridge National Laboratory, Oak Ridge, Tenn. Mar 60. 12p. Order from LC. Mi $2.40, ph $3.30. CF-60-3-119

Oxidation of hydrogen and carbon monoxide in helium by use of CuO. I. Prelimary results, by C. D. Scott. Oak Ridge National Laboratory, Oak Ridge, Tenn. July 60. 21p. Order from LC. Mi $2.70, ph $4.80. CF-60-7-26

Spectrophotometric studies of solutions at elevated temperatures and pressures: Status and program for FY-1961 and part of FY-1962, by R. E. Biggers and J. M. Chilton. Oak Ridge National Laboratory, Oak Ridge, Tenn. July 60. 13p. Order from LC. Mi $2.40, ph $3.30. CF-60-7-51

Comparison of weight changes of Columbium specimens with amount of impurities as determined by vacuum fusion analyses, by H. E. McCoy. Oak Ridge National Laboratory, Oak Ridge, Tenn. Aug 60. Order from LC. Mi $2.40, ph $3.30. CF-60-8-25

Determination of free acid in highly radioactive solutions by remotely controlled conductometric titration, by R. E. Corcoran and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. Oct 60. 9p. Order from LC. Mi $1.80, ph $1.80. CF-60-10-38

Maritime gas-cooled reactor program. X-ray study of the ternary system U-Al-O, by L. J. Dykstra. General Dynamics, General Atomic Division, San Diego, Calif. Sep 60. Contract AT(04-3)-187. 21p. Order from OTS. 75 cents. GA-1479

Fluorine disposal using charcoal, by N. W. Houston. Goodyear Atomic Corporation, Portsmouth, Ohio. July 60. Contract AT(33-3)-1. 12p. Order from LC. Mi $2.40, ph $3.30. GAT-T-819

Wet fluoride studies: Calcium plutonium (IV) fluoride, by P. B. Branin. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Dec 53. Decl. March 15, 1960. Contract W-31-109-Eng-52. 9p. Order from LC. Mi $1.80, ph $1.80. HW-30039

The preparation of plutonium (IV) ammonium fluoride and its decomposition to plutonium tetrafluoride for subsequent reduction to metal, by W. B. Tolley. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Mar 54. Decl. March 15, 1960. Contract W-31-109-Eng-52. 11p. Order from LC. Mi $2.40, ph $3.30. HW-31211

Continuous denitration status of development, January 12, 1955, by M. J. Szulinski. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Jan 55, Decl. June 10, 1960. Contract W-31-109-Eng-52. 9p. Order from LC. Mi $1.80, ph $1.80. HW-34470 (Rev.)

Thermal decomposition of plutonium (IV) oxalate and hydrofluorination of plutonium (IV) oxalate and oxide, by M. N. Myers. General Electric Company, Hanford Atomic Porducts Operation, Richland, Wash. Aug 56. Decl. April 28, 1960. Contract W-31-109-Eng-52. 30p. Order from LC. Mi $2.70, ph $4.80. HW-45128

Examination of corrosion test coupons in Purex 101 waste storage tanks--rm-147, by D. H. Parks. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Apr 57. Contract AT(45-1)-1350. 19p. Order from LC. Mi $2.40, ph $3.30. HW-49574

Oxygen diffusion and reaction during gamma irradiation of polyethylene, by R. C. Giberson. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. July 60. Contract AT(45-1)-1350. 40p. Order from LC. Mi $3.30, ph $7.80. HW-64305

An electrochemical determination of submicrogram quantities of molybdenum, by H. E. Palmer. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. July 60. Contract AT(45-1)-1350. 22p. Order from LC. Mi $2.70, ph $4.80. HW-66057

Decladding of Zircaloy clad uranium dioxide fuels by acidic fluoride solutions, by R. F. Maness. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Sep 60. Contract W-31-109-Eng-52. 14p. Order from LC. Mi $2.40, ph $3.30. HW-66884

Pilot plant development of a process for separating barium-140 from MTR fuel, by B. M. Legler and others. Phillips Petroleum Company, Atomic Energy Division, Idaho Falls, Idaho. Sep 55. Decl. August 15, 1960. Contract AT(10-1)-205. 171p. Order from LC. Mi $7.80, ph $25.80. IDO-14344

Low-cost Bridgman-type single-crystal growing apparatus, by E. H. Olson. Iowa State University of Science and Technology, Ames Laboratory, Ames, Iowa. Aug 60. Contract W-7405-eng-82. 51p. Order from OTS. $1.25. IS-178

Progress report on friction loss of slurries in straight tubes, by G. Murphy and others. Iowa State University of Science and Technology, Ames Laboratory, Ames, Iowa. Sep 60. Contract W-7405-eng-82. 99p. Order from OTS. $2.25. IS-197

Development of the continuous method for the reduction of uranium hexafluoride with hydrogen process development. Hot wall reactor, by S. H. Smiley and D. C. Brater. Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. June 58. Decl. with deletions August 21, 1959. 18p. Order from LC. Mi $2.40, ph $3.30. K-1379 (Del.)

Decontamination of irradiated U-235 samples for isotopic analysis, by J. W. Codding and others. Knolls Atomic Power Laboratory, Schenectady, N. Y. May 52. Decl. October 15, 1959. Contract W-31-109-Eng-52. 13p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-ELZ-5

Electrokinetic processes --Nuclear aspects. Quarterly progress report for February 1-April 30, 1957, by A. C. Werner and H. Katz. Vitro Laboratories, West Orange, N. J. May 57. Decl. June 10, 1960. Contract AT(30-1)-1996. 9p. Order from LC. Mi $1.80, ph $1.80. KLX-10077

Report for research on substitute materials for April 2, 1951 to July 2, 1951. (Actinium-227). Mound Laboratory, Miamisburg, Ohio. Aug 51. Decl. May 3, 1960. Contract AT-33-1-GEN-53. 71p. Order from LC. Mi $4.50, ph $12.30. MLM-613 (Del. 1)

Final safety analysis report of americium processing to be performed by the Martin Company, by J. Watcher. Martin Company, Nuclear Division, Baltimore, Md. May 60. Contract AT(30-3)-217. 66p. Order from LC. Mi $4.50, ph $12.30. MND-P-2347

Methods for analysis of polyphenyl reactor coolants, by R. T. Keen and others. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Jan 61. Contract AT(11-1)-GEN-8. 56p. Order from OTS. $1.25. NAA-SR-4356

Density-temperature relationships for irradiated diphenyl, by R. H. J. Gercke. Atomics International. Division of North American Aviation, Inc., Canoga Park, Calif. Nov 57. 4p. Order from LC. Mi $1.80, ph $1.80. NAA-SR-Memo-2268

Automatic spectrophotometry for chromatographic separations, by R. M. Kramer. Atomics International. Division of North American Aviation, Inc., Canoga Park, Calif. July 59. 25p. Order from LC. Mi $3.00, ph $6.30. NAA-SR-Memo-4188

The maximum solubility of water in terphenyl and polypnenyls, by H. Mandel. Atomics International, Division of North American Aviation, Inc., Canoga Park, Calif. Dec 59. 10p. Order from LC. Mi $2.40, ph $3.30. NAA-SR-Memo-4753

Least squares treatment of data involving non-linear functional relationships, by I. R. Tannenbaum and W. A. Young. Atomics International. A Division of North American Aviation Inc., June 60. 10p. Order from LC. Mi $2.40, ph $3.30. NAA-SR-Memo-5393

The radiochemistry of zinc, by H. G. Hicks. University of California, Lawrence Radiation Laboratory, Livermore, Calif. June 60. 58p. Order from OTS. 75 cents. NAS-NS-3015

The radiochemistry of protactinium, by H. W. Kirby. Mound Laboratory, Monsanto Chemical Company, Miamisburg, Ohio. Dec 59. 80p. Order from OTS. $1.00. NAS-NS-3016

The radiochemictry of iron, by J. M. Nielsen, Hanford Laboratories, Hanford Atomic Products Operation, Richland, Wash. Aug 60. 42p. Order from OTS. 50 cents. NAS NS-3017

The radiochemistry of manganese, by G. W. Leddicotte. Oak Ridge National Laboratory, Oak Ridge , Tenn. Oct 60. 23p. Order from OTS. 50 cents. NAS-NS-3018

The radiochemistry of carbon, nitrogen, and oxygen, by J. Hudis. Chemistry Department, Brookhaven National Laboratory, Upton, N. Y. Dec 60. 20p. Order from OTS. 50 cents. NAS-NS-3019

The production of high-purity beryllium carbide, by J. G. Theodore and others. Brush Beryllium Company, Cleveland, Ohio. Oct 52. Decl. September 21, 1960. Contract AT(30-1)-541. 20p. Order from LC. Mi $2.40, ph $3.30. NYO-1111

Progress report of pilot plant work on UF_4 production by continuous methods; period covered April 22, 1950 to July 31, 1950, by E. K. Teter. Mallinckrodt Chemical Works, St. Louis, Mo. Nov 50. Decl. March 7, 1960. 8p. Order from LC. Mi $1.80, ph $1.80. NYO-1313

Summary report on the long range program for the period May 1, 1953 to July 31, 1953, by C. J. Rodden. New Brunswick Laboratory, New Brunswick, N. J. Oct. 53. Decl. March 7, 1960. 131p. Order from LC. Mi $6.30, ph $19.80. NYO-2043

Second annual progress report to the United States Atomic Energy Commission, by J. G. Floss. Temple University, Research Institute, Philadelphia, Pa. Sep 59. Contract AT(30-1)-2082. 29p. Order from LC. Mi $2.70, ph $4.80. NYO-2156

Foam separation in isotope recovery. Quarterly report for the period July 1 to October 1, 1960, by R. A. Sanford. Radiation Applications Inc., Long Island City, N. Y. Oct 60. Contract AT (30-1)-2384. 27p. Order from LC. Mi $2.70, ph $4.80. NYO-2522

A study of the mechanism of radiation induced reactions of organic polymers with inorganic salts

and organometallic compounds. Quarterly summary report for April 1, 1960 to June 30, 1960, Radiation Applications Inc., Long Island City, N. Y. Aug 60. Contract AT(30-1)-2318. 6p. Order from LC. Mi $1.80, ph $1.80.
NYO-2526

The standard free energy of formation of certain rare earth carbides. Final report, by C. L. McCabe. Carnegie Institute of Technology, Metals Research Laboratory, Pittsburgh, Pa. Mar 60. Contract AT(30-1)-1825. 40p. Order from LC. Mi $3.00, ph $6.30. NYO-7432

Fused sodium hydroxide. Progress report for period covered June 1, 1959 to May 31, 1960, by R. P. Seward and H. W. Otto. Pensylvania State University, University Park, Pa. June 60. Contract AT(30-1)-1881. 8p. Order from LC Mi $1.80, ph $1.80. NYO-7581

Absorption and fluorescence spectra of uranium salts and other solids; spectra of molecules containing tritium IX. Annual report, by G. H. Dieke. Johns Hopkins University, Baltimore, Md. June 59. Contract AT(30-1)-1447. 12p. Order from LC. Mi $2.40, ph $3.30.
NYO-8098

The determination of strain and crystallite size in CaF_2 powders from the data of a single x-ray diffraction profile, by F. Witt and others. Franklin Institute Laboratories for Research and Development, Philadelphia and International Business Machines Corporation, Poughkeepsie, N. Y. Nov 58. Contract AT(30-1)-1484. 32p. Order from LC. Mi $3.00, ph $6.30.
NYO-8119 (Del.)

Corrosion by molten fluorides. Interim report, by L. S. RIchardson and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. Sep 52. Decl. May 9, 1960. Contract W-7405-eng-26. 20p. Order from LC. Mi $2.40, ph $3.30.
ORNL-1491

Phase equilibrium diagrams for fused salt systems, by R. E. Thoma and W. R. Grimes. Oak Ridge National Laboratory, Oak Ridge, Tenn. July 57. Decl. May 27, 1860. Contract W-7405-eng-26. 92p. Order from LC. Mi $4.80, ph $13.80.
ORNL-2295

Phase equilibria in molten salt breeder reactor fuels. I. The system LiF-BeF_2-UF_4-ThF_4, by C. F. Weaver and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 58p. Order from OTS. $1.50.
ORNL-2896

Survey of potential vapor-phase explosions in Darex and Sulfex processes, by K. S. Warren. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 22p. Order from OTS. 50 cents. ORNL-2937

Removal of silica from Darex dissolver solutions, by A. F. Messing and O. C. Dean. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 12p. Order from OTS. 50 cents. ORNL-3000

The solubility of water in benzene (thesis) by R. A. Pavia. North Carolina State College, Raleigh, N. C. Revised on the performance of contactors for liquid-liquid extraction. 1958. Contract AT(40-1)-1320. 123p. Order from LC. Mi $6.30, ph $19.80. ORO-287

Extraction of uranium from incinerator ash leach slurries, by J. C. Biery. Dow Chemical Company, Rocky Flats Plant, Denver, Colo. July 58. Decl. March 28, 1960. Contract AT(29-1)-1106. 67p. Order from LC. Mi $3.90, ph $10.80.
RFP-117

Quarterly report for April 1, 1960-June 30, 1960. Mellon Institute, Radiation Research Laboratories, Pittsburgh, Pa. July 60. Contract AT (30-1)-2310. 15p. Order from LC. Mi $2.40, ph $3.30. RRL-43

A study of the effect of various fluoride treatments on the properties of barium titanate and lead zirconate titanate polycrystalline ferroelectric ceramics, by D. L. Wilxox. Sandia Corporation, Albuquerque, N. Mex. Jan 61. 41p. Order from OTS. $1.50. SCTM-422-60(11)

Current commission methods for producing UO_3 UF_4, and UF_6. Mallinckrodt Chemical Works, St. Louis, Mo.; National Lead Company of Ohio, Cincinnati, Ohio; New Brunswick Laboratory, New Brunswick, N. J. and Union Carbide Nuclear Company, K-25 Plant, Oak Ridge, Tenn. Jan 56. Decl. with deletions November 5, 1959. 281p. Order from LC. Mi $11.10, ph $45.00.
TID-5295(Del.)

Radiation stability of organic liquids. Semi-annual report no. 6 for July 1, 1959 to December 31, 1959, by R. M. Wagner and R. Farrand. Stanford Research Institute, Menlo Park, Calif. Jan 60. 15p. Order from LC. Mi $2.40, ph $3.30. TID-5635

Absorption spectroscopy in liquid anhydrous hydrogen fluoride, by A. Tulumello. Purdue University, Lafayette, Ind. 1960. 10p. Order from LC. Mi $1.80, ph $1.80. TID-6059

Mercury-photosensitized reactions involving nitric oxide, nitrous oxide, and hydrogen, by M. Z. Hoffman and R. B. Bernstein. University of Michigan, Ann Arbor, Mich. June 60. Contract AT(11-1)-821. 42p. Order from LC. Mi $3.30, ph $7.80. TID-6062

Spectrophotometric determination of silicon in plutonium, by M. E. Smith. Los Alamos Scientific Laboratories, N. Mex. 1957. Decl. July 9, 1958. 17p. Order from LC. Mi $2.40, ph $3.30. TID-6071

A review of the extractive metallurgy of niobium, by M. E. Sibert and others. Horizons, Inc., Cleveland, Ohio. [1957?] Contract AT(30-1)-1894. 58p. Order from LC. Mi $3.60, ph $9.30. TID-6100

Absorption and fluorescence spectra of $NdCl_3$ and states of the neodymium ion, by E. H. Carlson. Johns Hopkins University, Baltimore, Md. Mar 60. Contract AT(30-1)-1447. 139p. Order from LC. Mi $6.90, ph $21.30. TID-6124

Absorption and fluorescence spectra of uranium salts and other solids spectra of molecules containing tritium X. Annual report, by G. H. Dieke. Johns Hopkins University, Baltimore, Md. June 23, 1960. Contract AT(30-1)-1447. 23p. Order from LC. Mi $2.70, ph $4.80. TID-6125

The determination of soluble poison concentrations in H_2O. Thesis, by R. A. Mattson. Argonne National Laboratory, Argonne, Ill. 1957. 64p. Order from LC. Mi $3.90, ph $10.80. TID-6143

Chemistry of polyvalent metal halides. A. Technical progress report for March 1, 1959 to February 29, 1960, by H. C. Brown. Purdue Research Foundation, Lafayette, Ind. 1960. Contract AT(11-1)-170. 65p. Order from LC. Mi $3.90, ph $10.80. TID-6149

Solvent extraction studies. An annual report, by G. G. Warren. Western State College of Colorado, Gunnison, Colo. May 60. Contract AT(11-1)-749. 27p. Order from LC. Mi $2.70, ph $4.80. TID-6150

Progress report on removal of strontium-85 from milk covering period November 1, 1959 to June 1, 1960, by W. D. Armstrong and L. Singer. University of Minnesota, Minneapolis, Minn. 1960. Contract AT(11-1)-838. 28p. Order from LC. Mi $2.70, ph $4.80. TID-6163

The graphite electrode: an improved technique for voltammetry and chronopotentiometry, by P. J. Elving and D. L. Smith. University of Michigan, Ann Arbor, Mich. June 60. Contract AT(11-1)-70. 39p. Order from LC. Mi $3.00, ph $6.30. TID-6167

Calculated and experimental propane mass spectra dependence upon electron voltage and sample temperature. Technical report no. VIII, by E. M. Eyring and A. L. Wahrhaftig. University of Utah, Salt Lake City, Utah. May 60. Contract AT(11-1)-82. 86p. Order from LC. Mi $4.80, ph $13.80. TID-6170

The effect of pressure on microgravimetric studies in hydrogen. Scientific paper 11-0807-11-P1, by O. M. Katz and E. A. Gulbransen. Westinghouse Electric Corporation, Research Laboratories, Pittsburgh, Pa. Jan 60. Contract AT-11-1-GEN-14. 19p. Order from LC. Mi $2.40, ph $3.30. TID-6175

Radiation stability of organic liquids. Semi-annual report no. 7 for January 1, 1960-June 30, 1960, by L. H. Towle and R. S. Farrand. Stanford Research Institute, Menlo Park, Calif. June 60. 30p. Order from LC. Mi $3.00, ph $6.30. TID-6186

On the structure and thermal decomposition of "ammonium diuranate," by K. J. Notz and others. National Lead Company of Ohio, Cincinnati, Ohio. [195?] 6p. Order from LC. Mi $1.80, ph $1.80. TID-6228

Studies of coordination compounds containing Olefin and Olefin-like ligands. Progress report from August 1, 1959 to July 31, 1960, by B. E. Douglas. University of Pittsburgh, Pittsburgh, Pa. July 60. Contract AT(30-1)-2274. 12p. Order from LC. Mi $1.80, ph $1.80. TID-6242

Eighth annual report on distribution studies between melts and solid phases using radioactive tracers, by W. C. Orr and others. University of Connecticut, Storrs, Conn. June 60. Contract AT(30-1)-1154. 55p. Order from LC. Mi $3.60, ph $9.30. TID-6243

Technical progress report for June 16, 1959 to June 16, 1960, by R. F. Firestone. Western Reserve University, Cleveland, Ohio. June 60. Contract AT(11-1)-685. 15p. Order from LC. Mi $2.40, ph $3.30. TID-6260

Laboratory studies pertaining to the treatment of TNT wastes, by E. R. Mathews and others. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. [195?]. 19p. Order from LC. Mi $2.70, ph $4.80. TID-6268

Progress report on chemistry for period covering May 16-July 15, 1960, Ionics, Inc., Cambridge, Mass. July 60. Contract AT(30-1)-2470. 22p. Order from LC. Mi $2.70, ph $4.80. TID-6277

Study of inorganic salts at high temperatures. Final technical report, by R. L. Seifert. University of Indiana, Bloomington, Ind. July 60. Contract AT(11-1)-410. 65p. Order from LC. Mi $3.90, ph $10.80. TID-6289

Progress report on radioinduced resin grafting for June 1960. Radiation Applications Inc., Long Island City, N. Y. Contract AT(30-1)-2318. 4p. Order from LC. Mi $1.80, ph $1.80. TID-6321

Indirect neutron absorptiometry, by W. W. Meinke. University of Michigan, Ann Arbor, Mich. [1957]. Contract AT(11-1)-70. 5p. Order from LC. Mi $2.40, ph $3.30. TID-6325

High concentration-ratio technique: Isotope fractionation at the methyl carbon in the reaction of cyanide ion and methyl iodide. Isotope effect under conditions of equal reagent concentrations, by K. R. Lynn and P. E. Yankwich. Unieersity of Illinois. Noyes Laboratory of Chemistry, Urbana, Ill. 1960. Contract AT(11-1)-67. 20p. Order from LC. Mi $2.40, ph $3.30. TID-6344

Progress report on solvent extraction for period covering July 16-August 15, 1960. Ionics, Inc., Cambridge, Mass. Aug 60. Contract AT(30-1)-2470. 15p. Order from LC. Mi $2.40, ph $3.30. TID-6357

Progress report on alkali halide purification, Technical report no. 12, Anderson Physical Laboratory, Champaign, Ill. July 60. Contract AT(11-1)-544. 13p. Order from LC. Mi $2.40, ph $3.30. TID-6403

Coprecipitation from homogeneous solution, Annual progress report, by L. Gordon and others. Case Institute of Technology, Cleveland, Ohio. June 60. Contract AT(11-1)-582. 100p. Order from LC. Mi $5.40, ph $15.30.
With this is a paper on the minimum ignition temperature of aluminum oxide precipitates, by O. I. Milner and L. Gordon. TID-6414

Determination of yttrium and rare earths in mixtures, Period covered July 9, 1957 to July 21, 1958, by R. R. Freeman, Jr. Michigan Chemical Corporation, St. Louis, Mich. July 58. 31p. Order from LC. Mi $3.00, ph $6.30. TID-6417

Spectrographic analysis of impurities in pure yttrium oxide. III. Studies on selective volatilization. Period covered September 12, 1958 to November 3, 1958, by A. B. Whitehead. Michigan Chemical Corporation, St. Louis, Mich. Nov 58. 7p. Order from LC. Mi $1.80, ph $1.80. TID-6419

Spectrographic analysis of impurities in pure yttrium oxide (revised method), Period covered October 4, 1957 to December 6, 1957, by A. B. Whitehead. Michigan Chemical Corporation, St. Louis, Mich. Dec 57. Revised January 7, 1958. Decl. February 6, 1959. 16p. Order from LC. Mi $2.40, ph $3.30. TID-6421

Evaluation of xenotime ore as a source of feed for the rare earth plant. Period covered July 26, 1956 to September 3, 1957, by J. R. Morton. Michigan Chemical Corporation, St. Louis, Mich. Nov 57. Decl. February 6, 1959. 4p. Order from LC. Mi $1.80, ph $1.80. TID-6422

The spectrophotometric analysis of rare earth mixtures. Period covered February 25 to August 30, 1957, by C. G. Shultz. Michigan Chemical Corporation, St. Louis, Mich. Oct 57. Decl. February 6, 1959. 6p. Order from LC. Mi $1.80, ph $1.80. TID-6423

Determination of yttrium in rare earth concentrations by x-ray fluorescence. Period covered March 13, 1957 to July 26, 1957, by C. G. Shultz. Michitan Chemical Corporation, St. Louis, Mich. Oct 57. Decl. February 6, 1959. 7p. Order from LC. Mi $1.80, ph $1.80. TID-6425

A spectrophotometric determination of silica in high purity yttrium oxide. Period covered August 16, 1957 to September 30, 1957. Michigan Chemical Corporation, St. Louis, Mich. Sep 57. Decl. February 6, 1959. 6p. Order from LC. Mi $1.80, ph $1.80. TID-6426

Spectrographic method of analysis for yttrium in ores. Period covered December 3, 1956 to March 1, 1957, by A. B. Whitehead. Michigan Chemical Corporation, St. Louis, Mich. Apr 57. Decl. February 6, 1959. 14p. Order from LC. Mi $2.40, ph $3.30. TID-6431

The analysis of ores for yttrium by x-ray flourescense. Period covered January 14 to April 23, 1957, by C. G. Shultz. Michigan Chemical Corporation, St. Louis, Mich. Apr 57. Decl. February 6, 1959. 9p. Order from LC. Mi $1.80, ph $1.80. TID-6432

Spectrographic analysis of impurities in pure yttrium oxide. Period covered March 1, 1957 to May 30, 1957 and July 1, 1957 to July 15, 1957, by A. B. Whitehead. Michigan Chemical Corporation, St. Louis, Mich. July 57. Decl. February 6, 1959. 8p. Order from LC. Mi $1.80, ph $1.80. TID-6433

Pilot plant evaluation of a Brazilian yttrium concentrate as rare earth plant feed. Period covered March 5, 1957 to June 11, 1957, by J. R. Morton. Michigan Chemical Corporation, St. Louis, Mich. Aug 57. Revised October 23, 1957. Decl. February 6, 1959. 2p. Order from LC. Mi $1.80, ph $1.80. TID-6434

Preparation of pure europium by electrolysis. Period covered July 22, 1957 to July 24, 1957, by J. R. Morton. Michigan Chemical Corporation, St. Louis, Mich. Aug 57. 2p. Order from LC. Mi $1.80, ph $1.80. TID-6436

The analysis of some volatile phosphorus compounds by gas-liquid chromatography, by S. H. Shipotofsky. Includes papers: Gas chromatographic analysis of some volatile phosphorus compounds, by S. H. Shipotofsky and H. C. Moser. Reactions of tritium atoms with frozen hydrocarbons, by R. D. Shores and H. C. Moser. Kansas State University, Manhattan, N. Y. 1960. Contract AT(11-1)-584. 22p. Order from LC. Mi $2.70, ph $4.80. TID-6437

Effect of structure on the stereochemistry of electrode reactions. Monobromo C_4-dibasic acids and esters, by P. J. Elving and others. Pennsylvania State University, University Park, Pa., and University of Michigan, Ann Arbor, Mich. Aug 60. Contract AT(30-1)-822. 25p. Order from LC. Mi $2.70, ph $4.80. TID-6441

Diffusion-kinetics in radiation chemistry. I. Generalized formulation and criticism of diffusion model, by A. Kuppermann and G. G. Belford. University of Illinois, Noyes Laboratory of Chemistry, Urbana, Ill. [1960] Contract AT (11-1)-691. 56p. Order from LC. Mi $3.60, ph $9.30. TID-6456

An improved laboratory cold-trap and procedure for reducing personnel hazard, by T. G. Burke. Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Sep 58. Revised July 15, 1960. 6p. Order from LC. Mi $1.80, ph $1.80. TID-6470

The faradaic admittance of electrochemical processes. III. The frequency dependence, by H. H. Bauer and Philip J. Elving. University of Michigan, Ann Arbor, Mich. June 60. Contract AT (11-1)-70. 17p. Order from LC. Mi $2.40, ph $3.30. TID-6474

Thermodynamics of the monohydrogen difluorides. III. Heat capacities of cesium, rubidium, and thallium monohydrogen difluorides from 7 to 305°K. Thesis, by G. A. Burney and E. E. Westrum, Jr. University of Michigan, Ann Arbor, Mich. [1960]. 19p. Order from LC. Mi $2.40, ph $3.30. TID-6509

Photogalvanic and photovoltaic effects with anodized zirconium and niobium electrodes, by W. M. Graven and others. University of Oregon, Eugene, Ore. Aug 60. Contract AT(45-1)-535. 45p. Order from LC. Mi $3.30, ph $7.80. TID-6514

Analytical chemistry at low concentrations, by J. T. Stock and M. A. Fill. University of Connecticut, Storrs, Conn. Aug 60. Contract AT(30-1)-1977. 31p. Order from LC. Mi $3.00, ph $6.30. TID-6525

The direct measurement of local absorbed dose by calorimetry. Investigation of the relation between the energy absorbed in a medium exposed to x-rays and electrons, the ionization produced in a gas cavity chamber in the same absorbing medium, and the oxidation of ferrous sulfate in the fricke dosimeter. Annual progress report for July 1, 1959—June 30, 1960, by J. S. Laughlin. Sloan-Kettering Institute for Cancer Research New York, N. Y. Aug 60. Contract AT(30-1)-1451. 10p. Order from LC. Mi $1.80, ph $1.80. TID-6534

Investigations relating to gas phase detonations. Final report, by M. G. Zabetakis and F. C. Gibson. Bureau of Mines. Explosives Research Laboratory, Pittsburgh, Pa. [nd]. 42p. Order from LC. Mi $3.30, ph $7.80. TID-6546

Thermodynamics of the monohydrogen difluorides. I. Decomposition reaction, fusion, phase transition and electrical conductivity of β-potassium monohydrogen difluoride, by M. L. Davis and E. F. Westrum, Jr. University of Michigan, Ann Arbor, Mich. [1957]. Contract AT(11-1)-70. 31p. Order from LC. Mi $3.00, ph $6.30. TID-6552

Synthesis of organic compounds. Final report, by H. Gilman. Iowa State University of Science and Technology, Ames, Iowa. [1959?]. Contract AT(11-1)-59. 19p. Order from LC. Mi $2.40, ph $3.30. TID-6586

A small-scale uranium hexafluoride plant, by S. H. Smiley. Oak Ridge Gaseous Diffusion Plant, Tenn. Dec 59. 6p. Order from LC. Mi $1.80, ph $1.80. TID-6635

The effect of certain variables on the polarization capacity of zirconium. Technical report no. XXXIII, by A. B. Johnson and others. University of Utah, Institute for th Study of Rate Processes, Salt Lake City, Utah. Oct 60. Contract AT(11-1)-82. 22p. Order from LC. Mi $2.70, ph $4.80. TID-6885

Coalescence and dispersion rates in agitated liquid-liquid systems, by J. H. Vanderveen. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. Dec 60. Contract W-7405-eng-48. 56p. Order from OTS. $1.25. UCRL-8733

The cross sections for the formation of astatine isotopes made by the bombardment of Bi^{209} with He^3, by E. T. Strom. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. Nov 60. Contract W-7405-eng-48. 31p. Order from OTS. 75 cents. UCRL-9372

An interferometric study of atomic mercury spectral lines, by R. Berg. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. Dec 60. Contract W-7405-eng-48. 23p. Order from OTS. 50 cents. UCRL-9512

Equilibrium constants for the formation of polynuclear tridentate 1:1 chelates in uranyl-malate, -citrate, and -tartrate systems. Deformation of the uranyl entity, by I. Feldman and others. University of Rochester, Atomic Energy Project, Rochester, N. Y. Oct 59. Contract W-7401-eng-49. 33p. Order from LC. Mi $3.00, ph $6.30. UR-559

Report on phase VI tests. [Specifications] T-474945: Hydrazine proof test. [Specification] T-474946: Flux recombination proof test, by Y. N. Solomon and P. Cohen. Westinghouse Electric Corporation, Atomic Power Division, Pittsburgh, Pa. May 54. Decl. with deletions Arril 29, 1957. 16p. Order from LC. Mi $2.40, ph $3.30. WAPD-CP-460(Del.)

Use of radiochemistry and mass spectrometry for fuel depletion studies, by J. E. Hudgens. Westinghouse Electric Corporation, Bettis Plant, Pittsburgh, Pa. 1960. Contract AT-11-1-GEN-14. 14p. Order from LC. Mi $2.40, ph $3.30. WAPD-T-1113

Nuclear materials control system (NMCS). Phase II. Analyst performance on synthetic Purex samples, by H. Ginsburg and C. C. Thomas, Jr. Westinghouse Electric Corporation, Atomic Power Department, Pittsburgh, Pa. Jan 60. Contract AT(30-1)-2176. 61p. Order from LC. Mi $3.90, ph $10.80. WCAP-6036

The determination of thorium and uranium as trace impurities in beryllium metal, by W. C. Dietrich. Union Carbide Nuclear Company, Division of Union Carbide Corporation, Y-12 Plant, Oak Ridge, Tenn. Dec 60. Contract W-7405-eng-26. 21p. Order from OTS. 50 cents. Y-1329

Controlled Thermonuclear Processes

Quarterly report covering the period July 1 - September 30, 1960, by L. Goldberg and others. Princeton University, Project Matterhorn, Princeton, N. J. Oct 60. Contract AT(30-1)-1238. 34p. Order from OTS. $1.00. MATT-Q-12

Thermonuclear project semiannual progress report for period ending July 31, 1960, by A. H. Snell and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 142p. Order from OTS. $2.75. ORNL-3011

Effect of energy degradation on the critical current in an OGRA-type device, by T. K. Fowler. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 20p. Order from OTS. 50 cents. ORNL-3037

Criticality Studies

Summary listing of subcritical measurements of heterogeneous water–uranium lattices made at Hanford, by R. C. Lloyd. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. June 60. Contract W-31-109-eng-52. 53p. Order from LC. Mi $3.60, ph $9.30. HW-65552

Multiplication of neutrons in small spheres of active material, by C. Richman. Los Alamos Scientific Laboratory, N. Mex. Apr 45. Decl. August 2, 1960. 18p. Order from LC. Mi $2.40, ph $3.30. LA-267

The Kukla prompt critical assembly. Hazards summary report, by E. R. Christie and B. W. Mar. University of California, Lawrence Radiation Laboratory, Livermore, Calif. Feb 60. Contract W-7405-eng-48. 86p. Order from OTS. $2.00. UCRL-6105

Critical mass studies. Part VI, by D. Callihan and others. Oak Ridge National Laboratory, Y-12 Area, Oak Ridge, Tenn. Aug 51. Decl. with deletions June 17, 1960. Contract W-7405-eng-26. 32p. Order from LC. Mi $3.00, ph $6.30. Y-801(Del.)

Engineering and Equipment

IN SITU tracers project. Quarterly progress report no. 2 for June - August 1959. Johnston (William H) Laboratories, Inc., Lafayette, Ind. 1959. Contract AT(11-1)-650. 32p. Order from LC. Mi $3.00, ph $6.30. AECU-4383

Remote maintenance experimental work on a reactor system pump, by W. B. McDonald and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. Apr 58. 35p. Order from LC. Mi $3.00, ph $6.30. CF-58-4-93

Study of outage experience with selected boiler and turbine generator units, by M. L. Myers. Oak Ridge National Laboratory, Oak Ridge, Tenn. Mar 60. 38p. Order from LC. Mi $3.00, ph $6.30. CF-60-3-56

Instruction manual, mercury relay pulse generator model Q-1212C, by E. Fairstein. Oak Ridge National Laboratory, Oak Ridge, Tenn. Sep 60. 10p. Order from LC. Mi $2.40, ph $3.30. CF-60-9-67

Momentum and heat transfer to a fluid flowing turbulently in a pipe, by R. J. Hefner. Oak Ridge Natinnal Laboratory, Oak Ridge, Tenn. Sep 60. 79p. Order from LC. Mi $4.50, ph $12.30. CF-60-9-69

Design basis for paddle pumps, by D. S. Webster and C. L. Williamson. E. I. du Pont de Nemours & Company, Savannah River Laboratory, Aiken, S. C. Jan 60. Contract AT(07-2)-1. 21p. Order from OTS. 75 cents. DP-451

Continuous solvent washing hydraulic characteristics of the turbine contactor, by D. S. Webster and C. L. Williamson. E. I. du Pont de Nemours & Company, Savannah River Laboratory, Aiken, S. C. Sep 60. Contract AT(07-2)-1. 20p. Order from OTS. 50 cents. DP-506

Leakage of water from valve stuffing boxes, by F. C. Apple. E. I. du Pont de Nemours and Company, Savannah River Laboratory, Aiken, S. C. Jan 61. Contract AT(07-2)-1. 12p. Order from OTS. 50 cents. DP-538

A dynamic digital delay generator for use in neutron chopper experiments, by W. M. Lopez and others. General Atomic Division, General Dynamics Corporation, San Diego, Calif. Sep 60. Contract AT(04-3)-167. 11p. Order from LC. Mi $2.40, ph $3.30. GA-1585

Two-phase flow rates and pressure drops in curved tubes, by H. L. Foltz. Goodyear Atomic Corporation, Portsmouth, Ohio. Jan 60. Contract AT(33-2)-1. 18p. Order from LC. Mi $2.40, ph $3.30. GAT-T-679

Operating manual for 105-C metal examination facility, by J. M. Fouts. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. May 60. Contract AT(45-1)-1350. 58p. Order from LC. Mi $3.60, ph $9.30. HW-58220 (Rev.)

Portable radiation instrumentation standardization, by W. G. Spear. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. July 60. 35p. Order from LC. Mi $3.00, ph $6.30. HW-60404 (Rev.)

Critical pressure ratio for a nozzle with two-phase fog flow, by W. J. Love. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Mar 60. 13p. Order from LC. Mi $2.40, ph $3.30. HW-64269

Time-temperature excursions of film blanketed fuel elements as measured by thermocouples and voltage taps, by C. L. Gregory. Knolls Atomic Power Laboratory, Schenectady, N. Y. [1958]. 31p. Order from LC. Mi $2.70, ph $4.80. KAPL-RDTR-308(Pt. VI)

Heat transfer for 7 1/4" -pitch ribbons at low flows, by C. L. Gregory. Knolls Atomic Power Laboratory, Schenectady, N. Y. Jan 60. 96p. Order from LC. Mi $5.40, ph $15.30. KAPL-RDTR-310(Pt. II)

Remote control equipment for plutonium metal production, by W. C. Hazen. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Oct 51. Decl. with deletions June 9, 1960. 221p. Order from LC. Mi $9.90, ph $34.80. LA-1387(Del.)

A study of various types of freeze type liquid metal valves, by E. O. Dryer. Atomics International Division of North American Aviation, Inc., Canoga Park, Calif. July 58. 13p. Order from LC. Mi $2.40, ph $3.30.
NAA-SR-Memo-2920

Thermal cycling and leakage tests of 12-inch sodium valves, by C. J. Baroczy. Atomics International Division of North American Aviation, Inc., Canoga Park, Calif. Sep 59. 30p. Order from LC. Mi $3.00, ph $6.30.
NAA-SR-Memo-3961

Stress relieving fitting—stress evaluation, by W. F. Anderson. Atomics International, Division of North American Aviation, Inc., Canoga Park, Calif. Aug 59. 6p. Order from LC. Mi $1.80, ph $1.80. NAA-SR-Memo-4268

Final performance tests of two-coolant-region sodium pump shaft freeze-seals, by F. O. Streck. Atomics International. Division of North American Aviation, Inc., Canoga Park, Calif. Feb 60. 44p. Order from LC. Mi $3.30, ph $7.80.
NAA-SR-Memo-4442

Test of a 24-inch diameter model of the HNPF cerrobend seal, by B. W. Admire. Atomics International. Division of North American Aviation, Inc., Canoga Park, Calif. Nov 59. 10p. Order from LC. Mi $2.40, ph $3.30.
NAA-SR-Memo-4682

Flexure tests of a helically coiled thermocouple, by K. H. Dearborn. Atomics International. Division of North American Aviation, Inc., Canoga Park, Calif. Dec 59. 4p. Order from LC. Mi $1.80, ph $1.80. NAA-SR-Memo-4717

Interim report on filter screening tests, by S. J. Sawyer. Atomics International. Division of North American Aviation, Inc., Canoga Park, Calif. Mar 60. 13p. Order from LC. Mi $2.40, ph $3.30. NAA-SR-Memo-4982

Compilation of experimental forced-convection, quality burnout data with calculated Reynolds numbers, by H. Firstenberg and others. Nuclear Development Corporation of America, White Plains, N. Y. June 60. Contract AT(30-1)-2303(IX). 60p. Order from LC. Mi $3.60, ph $9.30. NDA-2131-16

Ultrahigh vacuum techniques. Quarterly progress report for period covered January 1–March 31, 1960. Westinghouse Electric Corporation, Research Laboratories, Pittsburgh, Pa. Apg 60. Contract AT(30-1)-2176. 13p. Order from LC. Mi $2.40, ph $3.30. NYO-2899

The development of a theory of pulse column flooding behavior. Progress report no. 10 on the performance of contactors for liquid-liquid extraction, by F. P. Pike and E. E. Erickson. North Carolina State College, Raleigh, N. C. Apr 55. Contract AT(40-1)-1320. 76p. Order from LC. Mi $4.50, ph $12.30. ORO-288

The measurement of dynamic pressure drop in a pulse column. Progress report no. 12 on the performance of contactors for liquid-liquid extraction, by E. E. Erickson and others. North Carolina State College, Raleigh, N. C. Apr 55. Contract AT(40-1)-1320. 99p. Order from LC. Mi $5.40, ph $15.30. ORO-289

The development of a pulse-column sampling technique to overcome entrainment. Progress report no. 13 on the performance of contactors for liquid-liquid extraction, by E. E. Erickson and others. North Carolina State College, Raleigh, N. C. Apr 55, Contract AT(40-1)-1320. 55p. Order from LC. Mi $3.60, ph $9.30.
ORO-290

Comparative performance of expanded metal plates in a pulse column extractor. Thesis, by J. C. Park. Progress report no. 16 on the performance of contactors for liquid-liquid extraction. North Carolina State College, Raleigh, N. C. 1956. Contract AT(40-1)-1320. 151p. Order from LC. Mi $7.50, ph $24.30. ORO-291

Liquid-liquid heat transfer in a pulse column. Thesis, by S. C. Li. Progress report no. 18 on the performance of contactors for liquid-liquid extraction. North Carolina State College, Raleigh, N. C. 1957. Contract AT(40-1)-1320. 136p. Order from LC. Mi $6.90, ph $21.30.
ORO-293

Agitated liquid-liquid heat transfer. A study of the influence of temperature driving force on the heat transfer coefficient in a pulsed, countercurrent, sieve-plate contactor. Thesis, by R. P. Gardner. Progress report no. 21 on the performance of contactors for liquid-liquid extraction. North Carolina State College, Raleigh, N. C. 1958. Contract AT(40-1)-1320. 117p. Order from LC. Mi $6.00, ph $18.30.
ORO-295

Materials and process variables and their effect on contact resistance, by L. K. Jones. Sandia Corporation, Albuquerque, N. Mex. May 60. 18p. Order from LC. Mi $2.40, ph $3.30.
SCR-190

Integrating the quality control contribution in research and development operations, by L. E.

Snodgrass. Sandia Corporation, Albuquerque, N. Mex. Jan 61. 17p. Order from OTS. 75 cents. SCTM-419-60-25

The line recorder mass spectrometer as an analytical instrument, by W. O. Gentry. Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Sep 58. Contract W-7405-eng-26. 42p. Order from LC. Mi $3.30, ph $7.80. TID-6529

Progress report for research on heat transfer to fluids flowing through non-circular channels. Period covered March to September 1960, by E. R. G. Eckert and J. L. Novotny. University of Minnesota, Heat Transfer Laboratory, Minneapolis, Minn. Sep 60. Contract AT(11-1)-659. 55p. Order from LC. Mi $3.60, ph $9.30. TID-6568

High stability LC oscillator for use with a capacitive pressure sensing element. Thesis, by A. J. Eldridge. University of New Mexico, Albuquerque, N. Mex. 1955. 88p. Order from LC. Mi $4.80, ph $13.80. TID-6601

A versatile, horizontal electron diffraction unit with improved resolving power, by J. F. McLaughlin and W. W. Harris. Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Apr 60. Decl. October 5, 1960. Contract W-7405-eng-26. 23p. Order from LC. Mi $2.70, ph $4.80. TID-6606

Green's function for a circular ring with radiation type boundary conditions, by J. F. Heyda. General Electric Company, Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. Aug 60. Contracts AF 33(600)-38062 and AT(11-1)-171. 11p. Order from LC. Mi $2.40, ph $3.30. TID-6648

The effects of increasing mass spectrometer ion accelerating voltages, by A. Langdon and W. G. Hart. Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Feb 60. 7p. Order from LC. Mi $1.80, ph $1.80. TID-6679

A new saturable transformer measures direct current through conductors in the vicintiy of large stray magnetic fields, by A. Windsor. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. Oct 60. Contract W-7405-eng-48. 14p. Order from OTS. 50 cents. UCRL-9464

The E X B discharge as a source of ions, by K. W. Ehlers. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. Jan 61. Contract W-7405-eng-48. 26p. Order from OTS. 50 cents. UCRL-9503

Remote surface inspection techniques, by R. A. Betz. Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, Pittsburgh, Pa. 1960. Contract AT-11-1-GEN-14. 9p. Order from LC. Mi $1.80, ph $1.80. WAPD-T-1176

Fundamentals of radiography, by R. C. Barry. Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, Pittsburgh, Pa. 1960. Contract AT-11-1-GEN-14. 23p. Order from LC. Mi $2.70, ph $4.80. WAPD-T-1177

Nuclear materials control system (NMCS) phase II progress report for the period ending June 30, 1960. Westinghouse Electric Corporation, Atomic Power Department, Pittsburgh, Pa. July 60. Contract AT(30-1)-2176. 42p. Order from LC. Mi $3.30, ph $7.80. WCAP-6043

Geology and Mineralogy

Seismological investigations at the Hanford area, 1958-1959, by F. Neumann. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Nov 59. Includes reprint: Oscillator responses to earthquake motions, Trend Engineering University, Wash. Contract W-31-109-Eng-52. 96p. Order from LC. Mi $5.70, ph $16.80. HW-63832

Reconnaissance for uranium in the Uinta Basin of Colorado and Utah, by E. A. Noble and E. C. Annes, Jr. Exploration Division, Grand Junction Operations Office, AEC, Grand Junction, Colo. Jan 57. 22p. Order from OTS. 50 cents. RME-94

A study of Nevada test site wind variability, by J. W. Reed. Sandia Corporation, Albuquerque, N. Mex. Mar 58. 43p. Order from LC. Mi $3.30, ph $7.80. SC-4144(TR)

Analyses of ground water from Rainier Mesa, Nevada test site, Nye County, Nevada, by A. Clebsch, Jr. and F. B. Barker. Geological Survey, Washington, D.C. May 60. 23p. Order from LC. Mi $2.70, ph $4.80. TEI-763

Correlation and chronology of ore deposits and volcanic rocks. Annual progress report no. 2, by P. E. Damon and others. University of Arizona, Geochronology, Laboratory, Tucson, Ariz. July 60. Contract AT(11-1)-689. 114p. Order from LC. Mi $6.00, ph $18.30. TID-6482

Physical properties of salt samples. Final report, R. S. Guido and S. E. Werner. University of California, Lawrence Radiation Laboratory, Livermore, Calif. July 60. 14p. Order from LC. Mi $2.40, ph $3.30. UCRL-6069

Survey and selected bibliography of reactor fuel element assay systems. Nuclear materials control system (NMCS). Phase II, by S. L. Ruby and D. G. Gardner. Westinghouse Electric Corporation, Atomic Power Department, Pittsburgh, Pa. June 59. Contract AT(30-1)-2152. 41p. Order from LC. Mi $3.00, ph $6.30. WCAP-6014

Health and Safety

Environmental radioactivity at Argonne National Laboratory. Report for the year 1959, by J. Sedlet. Argonne National Laboratory, Argonne, Ill. Jan 61. Contract W-31-109-eng-38. 50p. Order from OTS. $1.25. ANL-6282

Preliminary studies of scavenging systems related to radioactive fallout, Letter report no. 7 covering period April 1 to May 31, 1959, by J. D. Stockham and J. Rosinski. Illinois Institute of Technology, Armour Research Foundation, Chicago, Ill. June 59. Contract AT(11-1)-626. 6p. Order from LC. Mi $1.80, ph $1.80. ARF-3127-7

Comparative nuclear effects of biomedical interest, by C. S. White and others. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. and the U. S. Atomic Energy Commission, Division of Biology and Medicine, Washington, D. C. Sep 60. 84p. Order from OTS. $1.00. CEX-58.8

A study of the contribution of the Rala process to atmospheric contamination of ORNL, by R. L. Bradshaw and W. D. Cottrell. Oak Ridge National Laboratory, Oak Ridge, Tenn. Nov 54. Decl. March 14, 1960. Contract W-7405-eng-26. 54p. Order from LC. Mi $3.60, ph $9.30. CF-54-11-186

Dissolver off-gas and rare gas plant hazards, by J. M. Holmes. Oak Ridge National Laboratory, Oak Ridge, Tenn. Nov 59. 10p. Order from LC. Mi $1.80, ph $1.80. CF-59-11-133

Contamination of shipping cask and storage canal water by fuels irradiated in pressurized water reactors--a review of pertinent subjects, by L. J. King. Oak Ridge National Laboratory, Oak Ridge, Tenn. Mar 60. 21p. Order from LC. Mi $2.70, ph $4.80. C F-60-3-49

Suggested RCG values for radioiodine isotopes in foods, by J. H. Horton. E. I. du Pont de Nemours & Company, Savannah River Laboratory, Aiken, S. C. Oct 60. Contract AT(07-2)-1. 18p. Order from OTS. 50 cents. DP-524

Evaluation of plastic films for protective suiting, by A. E. Symonds, Jr. E. I. du Pont de Nemours & Company, Savannah River Laboratory, Aiken, S. C. Nov 60. Contract AT(07-2)-1. 18p. Order from OTS. 50 cents. DP-528

Health instrument divisions quarterly progress report on research and development activities for January - March 1951, by H. M. Parker. Hanford Works, Richland, Wash. Apr 51. Decl. March 2, 1960. Contract W-31-109-Eng-52. 30p. Order from LC. Mi $2.70, ph $4.80. HW-20866

Radiological assistance plan, by P. Griffiths and G. J. Ball. Idaho Operations Office, Health and Safety Division, AEC. Idaho Falls, Idaho. June 60. 58p. Order from LC. Mi $3.60, ph $9.30. IDO-12013

Method of calculating lung dose received from a confined cloud of radioactive gas, by D. E. Hankins and W. C. King. Phillips Petroleum Company, Idaho Falls, Idaho. Dec 60. Contract AT(10-1)-205. 27p. Order from OTS. 50 cents. IDO-16632

Health physics manual of environmental monitoring, by M. R. Kennedy. Knolls Atomic Power Laboratory, Schenectady, N. Y. June 60. Contract W-31-109-ENG-92. 71p. Order from LC. Mi $4.50, ph $12.30. KAPL-A-HP-6

Evaluation of radioactive fallout. Interim progress report, by L. P. Salter. Nuclear Science and Engineering Corporation, Pittsburgh, Pa. Feb 60. Contract AT(30-1)-2420. 46p. Order from LC. Mi $3.30, ph $7.80. NSEC-22

Preliminary studies of scavenging systems related to radioactive fallout. Letter report no. 4 covering period October 1 to December 1, 1958, by J. D. Stockham and J. Rosinski. Illinois Institute of Technology, Armour Research Foundation, Chicago, Ill. Dec 58. Contract AT(11-1)-626. 3p. Order from LC. Mi $1.80, ph $1.80. TID-6117

Preliminary studies of scavenging systems related to radioactive fallout. Letter report no. 5 covering period December 1, 1958 to January 31, 1959, by J. D. Stockham and J. Rosinski. Illinois Institute of Technology, Armour Research Foundation, Chicago, Ill. Feb 59. Contract AT(11-1)-626. 6p. Order from LC. Mi $1.80, ph $1.80. TID-6118

Upper atmosphere monitoring program. Progress report no. 9, covering period August 1, 1959 through October 31, 1959, by J. Baumstark and others. General Mills, Inc., Minneapolis, Minn. June 60. Contract AT(11-1)-401. 41p. Order from LC. Mi $3.30, ph $7.80. TID-6207

A shielded container for transporting radioactive spent fuel, by B. B. Biggs. Knolls Atomic Power Laboratory, Schenectady, N. Y. July 60. 6p. Order from LC. Mi $1.80, ph $1.80. TID-6395

Studies of nuclear debris in precipitation. Quarterly progress report no. 4. Isotopes, Inc., Westwood, N. J. July 60. Contract AT(30-1)-2415. 57p. Order from LC. Mi $3.60, ph $9.30. TID-6485

Zirconium, Zircaloy, and hafnium safe practice guide for shipping, storing, handling, processing and scrap disposal, by W. W. Allison. Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, Pittsburgh, Pa. Dec 60. Contract AT-11-1-GEN-14. 30p. Order from OTS. 75 cents. WAPD-TM-17(Rev.)

Neutron dose calibration of indium personnel dosimeters for prompt-critical metal bursts, by J. W. Wachter and L. C. Emerson. Union Carbide Nuclear Company, Y-12 Plant, Oak Ridge, Tenn. Mar 56. Decl. with deletions August 13, 1959. Contract W-7405-eng-26. 31p. Order from LC. Mi $3.00, ph $6.30. Y-1092(Del.)

Instruments

A low dead-time neutron-counting system, by R. J. Epstein and D. C. Thompson. Argonne National Laboratory, Argonne, Ill. Jan 61. Contract W-31-109-eng-38. 16p. Order from OTS. 50 cents. ANL-6292

Detection of U^{235} buildup in separations processes by neutron multiplication, by A. C. Lapsley. E. I. du Pont de Nemours & Company, Savannah River Laboratory, Aiken, S. C. Dec 60. Contract AT(07-2)-1. 10p. Order from OTS. 50 cents. DP-533

A transistorized pulse height analyzer for gamma spectroscopy, by R. T. Graveson. New York Operations Office, Health and Safety Laboratory, AEC, New York, N. Y. Mar 59. 24p. Order from LC. Mi $2.70, ph $4.80. HASL-59

Analog and digital readout on an IBM output writer, by R. T. Graveson. New York Operations Office, Health and Safety Laboratory, AEC, New York, N. Y. Sep 60. 15p. Order from LC. Mi $2.40, ph $3.30. HASL-94

Studies in micromeritics. I. Particle deposition in conduits as a source of error in aerosol sampling, by A. K. Postma and L. C. Schwendiman. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. May 60. Contract AT(45-1)-1350. 24p. Order from LC. Mi $2.70, ph $4.80. HW-65308

The development of a beta-ray particle size analyzer. A new instrumental technique for automatic particle size analysis. Quarterly technical status report for the period January 15--April 15, 1960, by S. Z. Lewin and J. Conner. Evans Research and Development Corporation, New York, N. Y. Contract AT(30-1)-2372. 26p. Order from LC. Mi $2.70, ph $4.80. NYO-2656

Thermocouple research to 1000°C - Final report November 1, 1957, through June 30, 1959, by J. F. Potts, Jr. and D. L. McElroy. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 155p. Order from OTS. $2.75. ORNL-2773

Interim report on development of design criteria for relays. This report covers the period 1 September to 31 October 1960, Sandia Corporation, Albuquerque, N. Mex. Dec 60. 68p. Order from OTS. $2.00. SC-4530(RR)

A homing parachute system, by M. T. Kane and others. Sandia Corporation, Albuquerque, N. Mex. Jan 61. 35p. Order from OTS. $1.00. SC-4537(RR)

Safe thermal operation of power transistors under pulsed excitation, by G. R. Swain and W. W. Grannemann. University of New Mexico, Engineering Experiment Station, Albuquerque, N. Mex. Sep 58. Contract AT(20-1)-789. 75p. Order from LC. Mi $4.50, ph $12.30. SCDC-910

The use of compensation with directional couplers, by R. A. Lincoln. Sandia Corporation, Albuquerque, N. Mex. Jan 61. 53p. Order from OTS. $1.75. SCTM-149-60-27

Measurement of the directivity of a coaxial directional coupler by use of a length of precision transmission line, by W. E. Little. Sandia Corporation, Albuquerque, N. Mex. Jan 61. 23p. Order from OTS. 75 cents. SCTM-352-60-27

The Sandia Corporation 12-inch transonic wind tunnel analog-to-digital data gathering system, by D. R. MacKenzie. Sandia Corporation, Albuquerque, N. Mex. Jan 61. 47p. Order from OTS. $1.25. SCTM-371-60-71

Feasibility study of a thermistor vacuum gauge, by J. F. Taylor. Sandia Corporation, Albuquerque, N. Mex. Jan 61. 23p. Order from OTS. 75 cents. SCTM-402-60-14

Nuclear materials control system (NMCS). Phase II. Summary and progress report to December 31, 1959. Westinghouse Electric Corporation, Atomic Power Department, Pittsburgh, Pa. Dec 59. Contract AT(30-1)-2176. 91p. Order from LC. Mi $5.40, ph $15.30. WCAP-6037

Isotopes—Industrial Technology

Radiation-induced nitration of hydrocarbons, by M. J. Oestmann and others. Battelle Memorial Institute, Columbus, Ohio. Jan 61. Contract W-7405-eng-92. 14p. Order from OTS. 50 cents. BMI-1495

Determination of the lithium isotopic separation factor by ion exchange in the sulfonated polystyrene resin--lithium chloride system, by R. E. Blanco and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. Nov 53. Decl. with deletions June 10, 1960. 18p. Order from LC. Mi $2.40, ph $3.30. CF-53-11-47(Del.)

Summary report of thermionic isotopic power system through June 30, 1960, by R. J. Harvey. Martin Company, Nuclear Division, Baltimore, Md. 1960. Contract AT(30-3)-217. 535p. Order from LC. Mi $11.10, ph $91.80. MND-P-2399

Development of a double thickness/double density gamma gauge, by P. C. Aebersold. Nuclear Research Corporation, Southampton, Pa. Dec 59. Contract AT(30-1)-2304. 36p. Order from OTS. 75 cents. NYO-2480

The study of the potential applications of radioisotope technology to water resource investigations and utilization. Quarterly report no. 1. Isotopes, Inc., Westwood, N. J. June 60. Contract AT(30-1)-2477. 62p. Order from LC. Mi $3.90, ph $10.80. NYO-9037

The study of the potential applications of radioisotope technology to water resource investigations and utilization. Quarterly report no. 2. Isotopes, Inc., Westwood, N. J. Sep 60. Contract AT(30-1)-2477. 59p. Order from LC. Mi $3.60, ph $9.30. NYO-9038

Utilization of radioactive isotopes in coal process research. Quarterly technical status report no. 5 for May 1, 1960–July 31, 1960, by P. M. Yavorsky and E. Gorin. Consolidation Coal Co Company, Research and Development Division, Library, Pa. Aug 60. Contract AT(30-1)-2350. 18p. Order from LC. Mi $2.40, ph $3.30. NYO-9139

Chemistry related to the isotopic separation of tungsten by gaseous diffusion, by K. E. Rapp. Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Oct 59. 8p. Order from LC. Mi $1.80, ph $1.80. TID-6471

Radioisotopes in world industry. Abstracts of selected foreign literature. Office of Isotopes Development, U. S. Atomic Energy Commission, Washington, D. C. Jan 61. 141p. Order from OTS. $2.50. TID-6613

Isotope Separation

Theory of the simple-process flow-through centrifuge, by K. Cohen. Columbia University, New York, N. Y. [194?]. Decl. February 1, 1960. 44p. Order from LC. Mi $3.30, ph $7.80. A-50

Thermal phenomena in centrifugation, by C. Skarstrom and K. Cohen. Naval Research Laboratory, Washington, D. C. and Columbia University, New York, N. Y. [nd]. Decl. February 1, 1960. 10p. Order from LC. Mi $1.80, ph $1.80. A-51

The influence of baffles on a countercurrent ultracentrifuge, by K. Cohen. Columbia University New York, N. Y. [194?]. Decl. September 23,

1960. 10p. Order from LC. Mi $2.40, ph $3.30. A-52

Concentration of isotopes by fractional distillation in an ultracentrifuge, by K. Cohen. Columbia University, New York, N. Y. [194?]. Decl. February 1, 1960. 43p. Order from LC. Mi $3.30, ph $7.80. A-54

Absolute efficiencies of isotope separation by counter-current centrifuges. A new counter-current centrifuge, by K. Cohen and I. Kaplan. Columbia University, Substitute Alloy Materials Laboratory, New York, N. Y. Jan 42. Decl. February 1, 1960. 37p. Order from LC. Mi $3.00, ph $6.30. A-101

Concentration of the isotopes by centrifuging. Part I. Flow through method. Part II. Counter flow method. University of Virginia, Charlottesville, Va. Aug 42. Decl. February 1, 1960. 30p. Order from LC. Mi $2.70, ph $4.80. A-260

Long bowl gas separator, by F. C. Rushing. Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Apr 44. Decl. February 1, 1960. Contract OEMsr-415. 29p. Order from LC. Mi $2.70, ph $4.80. A-1911

Short bowl gas separator, by F. C. Rushing. Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Oct 44. Decl. February 1, 1960. Contract OEMsr-489. 33p. Order from LC. Mi $3.00, ph $6.30. A-3113

An investigation of thermal diffusion separation of U-232-U-233 as an alternate to remote processing, by S. H. Jury. Oak Ridge National Laboratory, Oak Ridge, Tenn. Mar 60. Contract W-7405-eng-26. 7p. Order from LC. Mi $1.80, ph $1.80. CF-60-3-37

Axial divergence calculations, by D. L. Thomas. Goodyear Atomic Corporation, Portsmouth, Ohio. Feb 60. Contract AT(33-2)-1. 5p. Order from LC. Mi $1.80, ph $1.80. GAT-DM-819

Separation of mercury isotopes by selective photoexcitation, by E. E. Voiland. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Mar 59. Contract W-31-109-Eng-52. 16p. Order from LC. Mi $2.40, ph $3.30. HW-59329

Applicability of gas centrifuge to isotope separation for elements heavier than titanium, by J. J. Barker. Kidde (Walter) Nuclear Laboratories, Inc., Garden City, N.Y. Sep 56. Decl. February 1, 1960. Contract AT(30-1)-1374. 52p. Order from LC. Mi $3.30, ph $7.80. NYO-7348

Separation of isotopes. Annual progress report, by R. I. Taylor. Columbia University, New York, N. Y. Oct 59. Contract AT(30-1)-755. 179p. Order from LC. Mi $8.10, ph $27.30. NYO-7763

Separation and exchange of isotopes. Annual progress report for July 1, 1959 to July 1, 1960, by W. Spindel and others. Rutgers University, Newark, N. J. 1959. Contract AT(30-1)-2250. 115p. Order from LC. Mi $6.00, ph $18.30. NYO-8769

The improved dual-temperature process for the production of heavy water (including cost analysis and pilot plant program), by J. S. Spevack. Oct 49. Decl. July 27, 1959. Contract AT (30-1)-759. 45p. Order from LC. Mi $3.30, ph $7.80. NYOO-85

The development of short bowl ultracentrifuges. Progress report, by G. Zippe. University of Virginia, Research Laboratory for Engineering Science, Charlottesville, Va. Nov 59. Contract AT(40-1)-2400. 22p. Order from LC. Mi $2.40, ph $3.30. ORO-216

Methods of calculating U-235 outputs and charges by use of ideal cascade theory, by A. J. Snyder. Office of Operations Analysis and Forecasting, Oak Ridge, Tenn. Feb 60. 38p. Order from OTS. 50 cents. TID-8522

Mathematics and Computers

Calculation methods for heterogeneous systems, by J. Chernick. Brookhaven National Laboratory, Upton, N. Y. Aug 60. 32p. Order from OTS. $1.00. BNL-622(T-189)

Evaluation of the zeros of cross-product Bessel functions, by L. J. Laslett and W. Lewish. Iowa State University of Science and Technology, Ames Laboratory, Ames, Iowa. Sep 60. Contract W-7405-eng-82. 174p. Order from OTS. $2.75. IS-189

Kare general mesh data, by J. A. Archibald, Jr. Knolls Atomic Power Laboratory, Schenectady, N. Y. May 60. Revised July 22, 1960. Contract W-31-109-eng-52. 17p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-JA-7(Rev.)

Electromagnetic production of pion pairs, by C. D. Zerby. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 103p. Order from OTS. $2.25. ORNL-3033

Improvement of Monte Carlo precision, by H. D. Brunk and G. P. Steck. Sandia Corporation, Albuquerque, N. Mex. Dec 55. 32p. Order from LC. Mi $3.00, ph $6.30. SCTM-248-55-51

Solution to a glass of singular integral equations occurring in mathematical physics. Thesis, by F. A. Hinchey. Sandia Corporation, Albuquerque, N. Mex. Aug 60. 76p. Order from LC. Mi $4.50, ph $12.30. SCTM-259-60-14

Use of dual-level logic aids in block diagram development, by R. H. Braasch. Sandia Corporation, Albuquerque, N. Mex. Dec 60. 18p. Order from OTS. 50 cents. SCTM-307-60-24

Summary technical progress report. University of Illinois, Digital Computer Laboratory, Urbana, Ill. Aug 60. Contract AT(11-1)-415. 373p. Order from LC. Mi $11.10, ph $54.60. TID-6495

A paper tape to magnetic tape converter, by L. F. Flores. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. Dec 60. Contract W-7405-eng-48. 16p. Order from OTS. 50 cents. UCRL-9483

BRIC - an IBM-704 two-dimensional nuclear-thermal depletion program with distributed void effects, by W. M. Jacobi and others. Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, Pittsburgh, Pa. Jan 61. Contract AT-11-1-GEN-14. 26p. Order from OTS. $1.00. WAPD-TM-208

CURF1—a least-squares polynomial fitting program for the Philco-2000, by A. V. Pace. Westinghouse, Electric Corporation, Bettis Atomic Power Laboratory, Pittsburgh, Pa. Jan 61. Contract AT-11-1-GEN-14. 11p. Order from OTS. 50 cents. WAPD-TM-226

Input preparation for diffusion-depletion programs on the Philco-2000 computer, by W. R. Cadwell and H. P. Henderson. Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, Pittsburgh, Pa. Jan 61. Contract AT-11-1-GEN-14. 14p. Order from OTS. 75 cents. WAPD-TM-238

WANDA-5—a one-dimensional neutron diffusion equation program for the Philco-2000 computer, by O. J. Marlowe and M. C. Suggs. Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, Pittsburgh, Pa. Nov 60. Contract AT-11-1-GEN-14. 31p. Order from OTS. $1.00. WAPD-TM-241

Metals, Ceramics, and Materials

Fission product release: A comparison between unclad metal fuel and clad plastic fuel, by G. F. Bogar and G. R. Hopkins. Westinghouse Electric Corporation, Atomic Power Division, Pittsburgh, Pa. Aug 56. Decl. with deletions May 6, 1957. 25p. Order from LC. Mi $2.70, ph $4.80. AECD-4254

Applications for lanthanon oxides and other compounds in the ceramic industry, by G. L. Ploetz and A. T. Muccigrosso. Knolls Atomic Power Laboratory, Schenectady, N. Y. Jan 60. 14p. Order from LC. Mi $2.40, ph $3.30. AECU-4639

A coated cast iron crucible for use with eutectic Al-Si alloy in the temperature range 595° - 650°C, by F. L. Yaggee. Argonne National Laboratory, Lemont, Ill. Nov 57. Decl. February 4, 1960. Contract W-31-109-eng-38. 37p. Order from LC. Mi $3.00, ph $6.30. ANL-5673

Niobium phase diagrams. Report no. 5: Columbium-hydrogen system. Report no. 6: Columbium-nitrogen system. Report no. 7: Columbium oxygen-nitrogen system. Report no. 8: Final technical report covering the period April 15, 1957 to April 15, 1960, by R. P. Elliot and S. Komjathy. Illinois Institute of Technology, Armour Research Foundation, Chicago, Ill. May 60. Contract AT(11-1)-515. 74p. Order from LC. Mi $4.50, ph $12.30. ARF-2120-5 thru 8

Euratom program. "Improved zirconium alloys," by D. Weinstein and R. J. Van Thyne. Illinois Institute of Technology, Armour Research Foundation, Chicago, Ill. Oct 60. Contract AT(11-1)-578. 11p. Order from LC. Mi $2.40, ph $3.30. ARF-2198-7

The boron-carbon system. Quarterly report no. 1 for May 1, 1960-July 31, 1960, by R. P. Elliot and R. J. Van Thyne. Illinois Institute of Technology, Armour Research Foundation, Chicago, Ill. Aug 60. Contract AT(11-1)-578. 13p. Order from LC. Mi $2.40, ph $3.30. ARF-2200-3

$MoSi_2$-UO_2 ceramics for high-temperature fuel elements, by J. R. Gambino and others. Battelle Memorial Institute, Columbus, Ohio. Aug 55. Decl. September 1, 1960. Contract W-7405-eng-92. 30p. Order from LC. Mi $2.70, ph $4.80. BMI-1029

Survey and selection of materials for programmatic evaluation for a gas-cooled reactor experiment, by D. L. Keller. Battelle Memorial Institute, Columbus, Ohio. Sep 56. Decl. with deletions December 4, 1959. Contract W-7405-eng-92. 86p. Order from LC. Mi $4.80, ph $13.80. BMI-1133(Del.)

Progress relating to civilian applications during August 1959, by R. W. Dayton and C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. Sep 59. Decl. October 8, 1959. Contract W-7405-eng-92. 102p. Order from LC. Mi $5.40, ph $15.30. BMI-1377

Progress relating to civilian applications during November 1959, by R. W. Dayton and C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. Dec 59. Decl. February 10, 1960. Contract W-7405-eng-92. 108p. Order from LC. Mi $5.70, ph $16.80. BMI-1398

Progress relating to civilian applications during January 1960, by R. W. Dayton and C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. Feb 60. Decl. April 20, 1960. Contract W-7405-eng-92. 88p. Order from LC. Mi $4.80, ph $13.80. BMI-1409

Progress relating to civilian applications during March, 1960, by R. W. Dayton and C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. Apr 60. Contract W-7405-eng-92. 103p. Order from OTS. $2.25. BMI-1430

Progress relating to civilian applications during April, 1960, by R. W. Dayton and C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. May 60. Contract W-7405-eng-92. 99p. Order from OTS. $2.50. BMI-1434

Progress relating to civilian applications during September, 1960, by R. W. Dayton and C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. Oct 60. Contract W-7405-eng-92. 80p. Order from OTS. $2.25. BMI-1469

Progress relating to civilian applications during November, 1960, by R. W. Dayton and C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. Dec 60. Contract W-7405-eng-92. 76p. Order from OTS. $2.00. BMI-1480

Progress relating to civilian applications during December, 1960, by R. W. Dayton, and C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. Jan 61. Contract W-7405-eng-92. 77p. Order from OTS. $2.00. BMI-1489(Rev.)

The effect of high-burnup irradiation on massive uranium carbide, by A. W. Hare and F. A. Rough. Battelle Memorial Institute, Columbus, Ohio. Jan 61. Contract W-7405-eng-92. 25p. Order from OTS. 75 cents. BMI-1491

Absorption and diffusion of xenon in high density graphite at high temperatures, by F. J. Salzano and A. M. Eshaya. Brookhaven National Laboratory, Upton, N. Y. Sep 60. 13p. Order from OTS. 50 cents. BNL-633 (T-196)

Process development quarterly report for April-June 1958, by Bridgeport Brass Company, Bridgeport, Conn. Feb 59. Decl. February 4, 1960. Contract AT(30-1)-1405. 74p. Order from LC. Mi $4.50, ph $12.30. BRB-47

Measurement of the dispersion of conductivity application to two uranium oxide-aluminum oxide samples, by D. P. Snowden. General Atomic Division, General Dynamics Corporation, San Diego, Calif. [195?]. Contract AT(04-3)-187. 12p. Order from LC. Mi $2.40, ph $3.30. GAMD-1234

Irradiation and examination of vibratory packed UO_2 high burnup program fuel elements, by T. J. Slosek and B. Weidenbaum. Vallecitos Atomic Laboratory, Atomic Power Equipment Department, General Electric Company, Pleasanton, Calif. Feb 60. Contract AT(04-3)-189. 53p. Order from OTS. $1.50. GEAP-3108(Pt. 2)

Studies on the compatibility of high-temperature carbon dioxide with stainless steels and other materials. Preliminary report. General Nuclear Engineering Corporation, Dunedin, Fla. Dec 59. 29p. Order from LC. Mi $2.70, ph $4.80. GNEC-121

Corrosion effects of lowering the pH in TBP waste storage tanks, by N. D. Groves. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Apr 54. Decl. March 24, 1960. 5p. Order from LC. Mi $1.80, ph $1.80. HW-30041

Post-irradiation examination of cluster-type fuel elements, by C. L. Boyd. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Nov 56. Decl. March 16, 1960. 8p. Order from LC. Mi $1.80, ph $1.80. HW-46472

Some new techniques in the use of ultrasonic attenuation in testing uranium fuel elements, by C. L. Frederick. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Mar 57. Decl. March 16, 1960. Contract W-31-109-Eng-52. 17p. Order from LC. Mi $2.40, ph $3.30. HW-48989

A proposed mechanism for the corrosion of aluminum in water, by R. L. Dillon. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Mar 59. Contract AT(45-1)-1350. 14p. Order from LC. Mi $2.40, ph $3.30. HW-59687

Uranium cold extrusion, by G. W. Riedeman. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Apr 59. Decl. September 1, 1960. Contract W-31-109-Eng-52. 20p. Order from LC. Mi $2.40, ph $3.30. HW-60059

Thermal cycling of plutonium. Part I. Observations of the physical damage resulting from thermal cycling plutonium through its low temperature phase transformations, by R. D. Nelson. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Sep 59. Contract AT(45-1)-1350. 30p. Order from LC. Mi $2.70, ph $4.80. HW-61681

Classification of PuO_2 particles, by J. B. Burnham. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Jan 60. 15p. Order from LC. Mi $2.40, ph $3.30. HW-63106

Studies on the oxides of plutonium, by T. D. Chikalla. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Dec 59. 53p. Order from LC. Mi $3.60, ph $9.30. HW-63574

Metallographic observations of swelling on uranium. Interim report, by T. B. Bierlein and others. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. June 60. Contract AT(45-1)-1350. 59p. Order from LC. Mi $3.60, ph $9.30. HW-63848

Comparison of the corrosion of carbon steel, stainless steel, inconel-X and stellite in the KER mockup tubes with out-of-reactor loops, by A. P. Larrick. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. Feb 60. 15p. Order from LC. Mi $2.40, ph $3.30. HW-63872

PRTR calandria fabrication report, by L. T. Pedersen and M. R. Kreiter. General Electric Company, Hanford Atomic Products Operation, Richland, Wash. July 60. Contract AT(45-1)-1350. 42p. Order from LC. Mi $3.30, ph $7.80. HW-64762

A multiple nondestructive test station for NPR fuel elements, by T. G. Lambert. Hanford Atomic Products Operation, Richland, Wash. June 60. Contract AT(45-1)-1350. 33p. Order from OTS. $1.00. HW-65910

Invention report: Hermetically sealed closure on a sheathed thermocouple, by B. S. Kosut. General Electric Company, Hanford Atomic Products, Operation, Richland, Wash. July 60. Contract AT(45-1)-1350. 4p. Order from LC. Mi $1.80, ph $1.80. HW-66043

Specialized casting and forming of reactive metal shapes. Period covered May 15, 1959-March 31, 1960, by T. A. Hamm. Oregon Metallurgical Corporation, Albany, Ore. Mar 60. Contract W-31-109-Eng-52. 20p. Order from LC. Mi $2.40, ph $3.30. HW-OREMET-1

Specialized casting and forming of reactive metal shapes. Period covered May 15, 1959-December 30, 1959, by T. A. Hamm. Oregon Metallurgical Corporation, Albany, Ore. Dec 59. Contract W-31-109-Eng-52. 15p. Order from LC. Mi $2.40, ph $3.30. HW-OREMET-3

Specialized casting and forming of reactive metal shapes. Period covered October 19, 1959-April 30, 1960, by T. A. Hamm. Oregon Metallurgical Corporation, Albany, Ore. Apr 60. Contract W-31-109-Eng-52. 10p. Order from LC. Mi $1.80, ph $1.80. HW-OREMET-4

The structure of U_2Zn_{17}, by C. L. Vold and D. T. Peterson. Iowa State University of Science and Technology, Ames Laboratory, Ames, Iowa. Jan 61. Contract W-7405-eng-82. 28p. Order from OTS. 75 cents. IS-246

The application of infrared techniques to the study of the corrosion film on Zircaloy, by H. A. Fisch and others. General Electric Company, Knolls Atomic Power Laboratory, Schenectady, N. Y. Jan 59. Contract W-13-109-Eng-52. 10p. Order from OTS. 50 cents. KAPL-2052

Radiation effects upon the recovery of the mechanical properties of metals, by E. N. Aqua and R. J. Allio. General Electric Company, Knolls Atomic Power Laboratory, Schenectady, N. Y. Oct 60. Contract W-31-109-Eng-52. 27p. Order from OTS. $1.00. KAPL-2103

Effects of electrical discharge machining (eloxing) of Zircaloy, by J. O. Mirate. Knolls Atomic Power Laboratory, Schenectady, N. Y. July 60. Contract W-31-109-Eng-52. 13p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-JOM-2

Fabrication of tantalum capsules for LAMPRE I reactor, by G. S. Hanks and J. M. Taub. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. June 60. Contract W-7405-eng-36. 64p. Order from LC. Mi $3.90, ph $10.80. LAMS-2434

Phase transformation, twinning, an anelastic phenomenon associated with zirconium hydride, by R. Chang. Atomics International. Division of North American Aviation, Inc., Canoga Park Calif. Sep 60. Contract AT-11-1-GEN-8. 15p. Order from LC. Mi $1.80, ph $1.80. NAA-SR-5537

Post service metallurgical examination of Griscom-Russell two-tube superheater, by J. P. Page. Atomics International. Division of North American Aviation, Inc., Canoga Park, Calif. Jan 60. 5p. Order from LC. Mi $1.80, ph $1.80. NAA-SR-Memo-4854

Ingot mold heating as a method of controlling metal quality, by E. B. Blasch and others. National Lead Company of Ohio, Cincinnati, Ohio. Sep 57. Decl. March 30, 1960. Contract AT(30-1)-1156. 47p. Order from LC. Mi $3.30, ph $7.80. NLCO-697

Atomic power development associates progress report for July 1, 1954-January 31, 1955, by R. Evans and others. Nuclear Metals, Inc., Cambridge, Mass. Apr 55. Decl. February 4, 1960. Contract AT(30-1)-1565. 25p. Order from LC. Mi $2.70, ph $4.80. NMI-1133

Proceedings of the ninth annual AEC corrosion symposium, May 10-12, 1960, by J. P. Pemsler. Nuclear Metals, Inc., Concord, Mass. July 60. 55p. Order from LC. Mi $3.60, ph $9.30. NMI-1220

Fundamental and applied research and development in metallurgy. Progress report for July 1960. Nuclear Metals, Inc., Concord, Mass. Aug 60. Contract AT(30-1)-1565. 21p. Order from LC. Mi $2.70, ph $4.80. NMI-2087

Fundamental and applied research and development in metallurgy. Progress report for August 1960. Nuclear Metals, Inc., Concord, Mass. Sep 60. Contract AT(30-1)-1565. 27p. Order from LC. Mi $2.70, ph $4.80. NMI-2088

Fundamental and applied research and development in metallurgy. Progress report for September 1960. Nuclear Metals, Inc., Concord, Mass. Oct 60. Contract AT(30-1)-1565. 28p. Order from LC. Mi $2.70, ph $4.80. NMI-2089

The fabrication of clad massive UO_2 fuel elements by coextrusion. Third quarterly report, by J. G. Hunt and P. Loewenstein. Nuclear Metals, Inc., Concord, Mass. Apr 60. Contract AT(30-1)-1565. 26p. Order from LC. Mi $2.70, ph $4.80. NMI-2508

Spheroidization heat treatment and re-evaluation of Zircaloy-clad U-2 w/o Zr alloy tube no. 28, extrusion no. 18388, by D. F. Kaufman and others. Nuclear Metals, Inc., Concord, Mass. July 60. Contract AT(30-1)-1565. 38p. Order from LC. Mi $3.00, ph $6.30. NMI-4377 (Suppl.)

Power reactor program. Progress report for the period March 1, 1959 through March 31, 1959, by S. Isserow and others. Nuclear Metals, Inc., Concord, Mass. July 59. Contract AT(30-1)-1565. 22p. Order from LC. Mi $2.70, ph $4.80. NMI-4392

Power reactor program. Progress report for the period August 1, 1959 through August 31, 1959, by S. Isserow, and others. Nuclear Metals, Inc., Concord, Mass. Nov 59. Contract AT(30-1)-1565. 17p. Order from LC. Mi $2.40, ph $3.30. NMI-4397

Power reactor program. Progress report for the period September 1, 1959 through September 30, 1959, by D. F. Kaufman and others. Nuclear Metals, Inc., Concord, Mass. Nov 59. Contract AT(30-1)-1565. 40p. Order from LC. Mi $3.00, ph $6.30. NMI-4398

Power reactor program. Progress report for the period October 1, 1959 through October 31, 1959,

by R. G. Jenkins and others. Nuclear Metals, Inc., Concord, Mass. Mar 60. Contract AT (30-1)-1565. 27p. Order from LC. Mi $2.70, ph $4.80. NMI-7221

Power reactor program. Progress report for the period November 1, 1959 through November 30, 1959, by W. J. Richmond and others. Nuclear Metals, Inc., Concord, Mass. June 60. Contract AT(30-1)-1565. 39p. Order from LC. Mi $3.00, ph $6.30. NMI-7222

Power reactor program. Progress report for the period December 1, 1959 through December 31, 1959, by W. B. Tuffin and others. Nuclear Metals, Inc., Concord, Mass. June 60. Contract AT(30-1)-1565. 44p. Order from LC. Mi $3.30, ph $7.80. NMI-7223

Power reactor program. Progress report for the period January 1, 1960 through January 31, 1960, by H. M. Green and others. Nuclear Metals, Inc., Concord, Mass. June 60. Contract AT (30-1)-1565. 37p. Order from LC. Mi $3.00, ph $6.30. NMI-7224

Power reactor program. Progress report for the period March 1, 1960 through March 31, 1960, by W. J. Richmond and others. Nuclear Metals, Inc., Concord, Mass. July 60. Contract AT (30-1)-1565. 34p. Order from LC. Mi $3.00, ph $6.30. NMI-7226

Power reactor program. Progress report for the period April 1, 1960 through April 30, 1960, by A. M. White and others. Nuclear Metals, Inc., Concord, Mass. July 60. Contract AT (30-1)-1565. 36p. Order from LC. Mi $3.00, ph $6.30. NMI-7227

Power reactor program. Progress report for the period May 1, 1960 through May 31, 1960, by A. D. Donaldson and others. Nuclear Metals, Inc., Concord, Mass. July 60. Contract AT (30-1)-1565. 31p. Order from LC. Mi $2.70, ph $4.80. NMI-7228

Power reactor program. Progress report for the period June 1, 1960 through June 30, 1960, by H. F. Sawyer and others. Nuclear Metals, Inc., Concord, Mass. Aug 60. Contract AT(30-1)-1565. 34p. Order from LC. Mi $3.00, ph $6.30. NMI-7229

Power reactor program. Progress report for the period July 1, 1960 through July 31, 1960, by P. R. Smoot, and others. Nuclear Metals, Inc., Concord, Mass. Sep 60. Contract AT(30-1)-1565. 32p. Order from LC. Mi $2.70, ph $4.80. NMI-7230

The development and testing of the UO_2 fuel element system, Quarterly report for June 1, 1960-August 31, 1960. Combustion Engineering, Inc., Nuclear Division, Windson, Conn. 1960. Contract AT(30-1)-2379. 47p. Order from LC. Mi $3.30, ph $7.80. NYO-9009 (CEND-99)

Fuel element development program for the pebble bed reactor. Quarterly progress report for February 1, to April 30, 1960. Sanderson and Porter, New York, N.Y. 1960. Decl. May 23, 1960. Contract AT(30-1)-2378. 85p. Order from LC. Mi $4.80, ph $13.80. NYO-9058

Thorium oxide infiltration of graphite spheres, by W. E. Parker and F. Rusinko, Jr. Speer Carbon Company, Research Laboratory, Niagara Falls, N. Y. June 60. Contract AT(30-1)-2378. 44p. Order from LC. Mi $3.30, ph $7.80. NYO-9059

The electrical resistivity of liquid sodium and dilute sodium alloys. Final report, by J. F. Freedman and W. D. Robertson. Yale University, Hammond Metallurgical Laboratory, New Haven, Conn. Oct 59. Contract AT(30-1)-1857. 45p. Order from LC. Mi $3.30, ph $7.80. NYO-9316

Metallurgy division annual progress report for period ending July 1, 1960. Oak Ridge National Laboratory, Oak Ridge, Tenn. Sep 60. Contract W-7405-eng-26. 503p. Order from LC. Mi $11.10, ph $82.80. ORNL-2988

Columbium-clad uranium carbide fuel element contract. Monthly letter report for February 1 through February 29, 1960, by J. J. Finley and others. Union Carbide Metals Company, Niagara Falls, N.Y. 1960. Contract AT(40-1)-2559. 5p. Order from LC. Mi $1.80, ph $1.80. ORO-266

Synthesis and fabrication of refractory uranium compounds, Monthly progress report no. 8 for April 1 through April 31, 1960, by K. M. Taylor. and others. Carborundum Company, Niagara Falls, N. Y. May 60. Contract AT(40-1)-2558. 5p. Order from LC. Mi $1.80, ph $1.80. ORO-276

Fuel bearing fiberglass aluminum base fuel elements. Monthly progress letter no. 11 for April 1, 1960 to April 30, 1960, by R. H. Baskey. Clevite Corporation, Mechanical Research Division, Cleveland, Ohio. May 60. Contract AT (40-1)-2557. 3p. Order from LC. Mi $1.80, ph $1.80. ORO-277

Fuel bearing fiberglas in aluminum base fuel elements. Monthly progress letter no. 12 for May 1, 1960 to May 30, 1960, by R. H. Baskey. Clevite Corporation, Mechanical Research Division, Cleveland, Ohio. June 60. Contract AT (40-1)-2557. 5p. Order from LC. Mi $1.80, ph $1.80. ORO-303

Graphite-matrix nuclear fuel elements. Interim status report for November 1, 1959 through June 30, 1960. National Carbon Company, Research Laboratories, Cleveland, Ohio and National Carbon Company, Product and Process Development Laboratory, Fostoria, Ohio. July 60. Contract AT(40-1)-2560. 57p. Order from LC. Mi $3.60, ph $9.30. ORO-309

Fuel bearing fiberglas in aluminum base fuel elements. Monthly progress letter no. 14 for period July 1, 1960 to July 31, 1960, by R. H. Baskey. Clevite Corporation, Mechanical Research Division, Cleveland, Ohio. Aug 60. Contract AT(40-1)-2557. 3p. Order from LC. Mi $1.80, ph $1.80. ORO-313

Fuel bearing fiberglas in aluminum base fuel elements. Monthly progress letter no. 15 for August 1, 1960 to August 31, 1960, by R. H. Baskey. Clevite Corporation, Mechanical Research Division, Cleveland, Ohio. Sep 60. Contract AT(40-1)-2557. 3p. Order from LC. Mi $1.80, ph $1.80. ORO-322

Synthesis and fabrication of refractory uranium compounds. Monthly progress report no. 10 for September 1 through September 30, 1960, by K. M. Taylor and C. H. McMurtry. Carborundum Company, Research and Development Division, Niagara Falls, N. Y. Oct 60. Contract AT(40-1)-2558. 2p. Order from LC. Mi $1.80, ph $1.80. ORO-331

Preferred orientation in cross-rolled uranium, by G. R. Mallett. The Dow Chemical Company, Rocky Flats Plant, Denver, Colo. Feb 61. Contract AT(20-1)-1106. 41p. Order from OTS. $1.00. RFP-216

Advanced fabrication development of strut-type elements, by J. A. Ruzga. Sylvania-Corning Nuclear Corporation, Bayside, N. Y. Dec 58. Decl. June 9, 1960. Contract AT-30-1-GEN-366. 24p. Order from LC. Mi $2.70, ph $4.80. SCNC-258

Low cost ceramic fuel elements by isostatic pressing, by J. Fugardi and J. L. Zambrow. Sylvania Corning Nuclear Corporation, Bayside, N. Y. July 59. Decl. November 18, 1959. Contract AT-30-1-GEN-366. 22p. Order from LC. Mi $2.70, ph $4.80. SCNC-289

Titanium dioxide as a semiconductor. Period covered November 6, 1958 to November 6, 1959, by R. Bechtel and others. University of New Mexico, Engineering Experiment Station, Albuquerque, N. Mex. 1959. 12p. Order from LC. Mi $2.40, ph $3.30. SCDC-952(UNM-290-198)

General purpose adhesives, by H. Moore. Sandia Corporation, Albuquerque, N. Mex. Jan 61. 10p. Order from OTS. 50 cents. SCTM-351-60-25

Exploratory study on ultrasonic inspection of hot pressed uranium slugs, by G. Thomas and others. Sylvania Electric Products Inc., Atomic Energy Division, Bayside, N. Y. Dec 53. Dec 53. Decl. March 7, 1960. 20p. Order from LC. Mi $2.70, ph $4.80. SEP-217

The determination of the equilibrium phase diagram, zirconium-niobium. Monthly letter report no. 13 for May 1, 1960 to June 1, 1960, by C. E. Lundin. University of Denver, Denver Research Institute, Denver, Colo. June 60. Contract AT(11-1)-752. 4p. Order from LC. Mi $1.80, ph $1.80. TID-6061

Slip casting of nuclear fuel elements. Report no. IV, by E. H. Baron and others. Stevens Institute of Technology, Powder Metallurgy Laboratory, Hoboken, N. J. June 60. Contract AT(30-1)-2258. 9p. Order from LC. Mi $1.80, ph $1.80. TID-6090

Investigation of electrolytic processes for preparation of high purity niobium metal, by A. J. Kolk, Jr. and others. Horizons, Inc., Cleveland, Ohio. 1960. Contract AT(30-1)-1894. 26p. Order from LC. Mi $2.70, ph $4.80. TID-6101

Effects of non-uniformities on the hardening of crystals, by R. L. Fleischer. Massachusetts Institute of Technology, Metals Processing Laboratory, Cambridge, Mass. 1959. Contract AT(30-1)-1310. 22p. Order from LC. Mi $2.70, ph $4.80. TID-6126

Easy glide and grain boundary effects in polycrystalline aluminum, by R. L. Fleischer and W. F. Hosford, Jr. Massachusetts Institute of Technology, Metals Processing Laboratory, Cambridge, Mass. 1960. Contract AT(30-1)-1310. 16p. Order from LC. Mi $2.40, ph $3.30. TID-6127

The corrosion of the Inconel HF inlet and salt outlet line of the MK II dissolver, by F. W. Fink. Battelle Memorial Institute, Columbus, Ohio.

July 60. 11p. Order from LC. Mi $2.40, ph $3.30. TID-6215

Study of factors influencing ductility of iron-aluminum alloys. Monthly letter report no. 2, by F. C. Perkins and J. F. Nachman. University of Denver, Denver Research Institute, Denver, Colo. July 60. Contract AT(11-1)-742. 3p. Order from LC. Mi $1.80, ph $1.80. TID-6294

Preparation of UC_2-ThC_2--graphite fuel bodies for the GA-308 HTGR capsule irradiations, W. V. Goeddel. General Atomic Division, General Dynamics Corporation, San Diego, Calif. Sep 59. Contract AT(04-3)314. 24p. Order from LC. Mi $2.70, ph $4.80. TID-6339

Studies in nuclear spectroscopy. Technical progress report for October 15, 1959 through June 30, 1960, by R. C. Pilger, Jr. University of Notre Dame, Notre Dame, Ind. 1960. Contract AT (11-1)-834. 7p. Order from LC. Mi $1.80, ph $1.80. TID-6345

Electrochemical studies of nonaqueous melts. Annual report, by G. Derge. Carnegie Institute of Technology, Metals Research Laboratory, Pittsburgh, Pa. July 60. Contract AT(30-1)-1024. 18p. Order from LC. Mi $2.40, ph $3.30. TID-6382

Corrosion testing of metals in the liquid-liquid extraction pilot unit. Period covered September 12, 1958 to March 4, 1959, by P. A. Lincoln. Michigan Chemical Corporation, St. Louis, Mich. 1959. 10p. Order from LC. Mi $1.80, ph $1.80. TID-6418

Fuel cycle development program monthly newsletter for July 1960, by R. L. Robinson. National Carbon Company, Fostoria, Ohio. Aug 60. Contract AT(40-1)-2560. 10p. Order from LC. Mi $1.80, ph $1.80. TID-6463

Electrochemical studies of hafnium, zirconium and yttrium. Quarterly progress report no. 10 for January 1, 1960 to March 31, 1960. Bureau of Mines. Boulder City Metallurgy Research Laboratory, Boulder City, Nev. Mar 60. Contract AT(11-1)-475. 5p. Order from LC. Mi $1.80, ph $1.80. TID-6480

Electrochemical studies of hafnium, zirconium and yttrium; pure metals project: Hafnium, zirconium and program. Quarterly progress report no. 11 for April 1, 1960 to June 30, 1960. Bureau of Mines. Boulder City Metallurgy Research Laboratory, Boulder City, Nev. June 60. Contract AT(11-1)-475. 5p. Order from LC. Mi $1.80, ph $1.80. TID-6481

Study of factors influencing ductility of iron-aluminum alloys. Monthly letter report for March 15, 1959 to March 15, 1960, by F. C. Perkins and J. F. Nachman. University of Denver, Denver Research Institute, Denver, Colo. Jan 60. Contract AT(11-1)-742. 8p. Order from LC. Mi $1.80, ph $1.80. TID-6562

Study of factors influencing ductility of iron-aluminum alloys. Monthly letter report no. 11 for March 15, 1959 to March 15, 1960, by F. C. Perkins and J. F. Nachman. University of Denver, Denver Research Institute, Denver, Colo. Mar 60. Contract AT(11-1)-742. 7p. Order from LC. Mi $1.80, ph $1.80. TID-6564

Study of factors influencing ductility of iron-aluminum alloys. Monthly letter report for March 15, 1959 to April 30, 1960, by F. C. Perkins and J. F. Nachman. University of Denver, Denver Research Institute, Denver, Colo. Apr 60. Contract AT(11-1)-742. 4p. Order from LC. Mi $1.80, ph $1.80. TID-6565

Recrystallization and sintering of oxides. Progress report for September 1, 1959 to August 31, 1960. University of Utah, Institute for the Study of Rate Processes, Salt Lake City, Utah. Aug 60. Contract AT(11-1)-82. 35p. Order from LC. Mi $3.00, ph $6.30. TID-6572

Research on metals and alloys at low temperatures. Report no. 5 for September 1, 1959 to July 1, 1960, by W. F. Love. University of Colorado, Boulder, Colo. Aug 60. Contract AT(11-1)-377. 50p. Order from LC. Mi $3.30, ph $7.80. TID-6578

Synthesis and fabrication of refractory uranium compounds, Quarterly report no. 4 for March 1 to April 30 and July 1 to July 31, 1960, by K. M. Taylor and others. Carborundum Company, Research and Development Division, Niagara Falls, N. Y. Aug 60. 15p. Order from LC. Mi $2.40, ph $3.30. TID-6591

Study of x-ray effects caused by point defects in metals. Interim report for June 1 to August 31, 1960, by F. R. L. Schoning. Franklin Institute Laboratories for Research and Development, Philadelphia, Pa. 1960. Contract AT(30-1)-2585. 5p. Order from LC. Mi $1.80, ph $1.80. TID-6651

Study of factors influencing ductility of iron-aluminum alloys, Monthly letter report no. 4, by G. Rauscher and J. F. Nachman. University of Denver, Denver Research Institute, Denver, Colo. Sep 60. Contract AT(11-1)-742. 5p. Order from LC. Mi $1.80, ph $1.80. TID-6691

The kinetics of transformation of niobium-base zirconium alloys. Monthly letter report no. 4 for August 1, 1960 to September 1, 1960, by C. E. Lundin. University of Denver, Denver Research Institute, Denver , Colo. Sep 60. Contract AT(11-1)-752. 3p. Order from LC. Mi $1.80, ph $1.80. TID-6692

The study factors influencing ductility of iron-aluminum alloys, Interim report, by G. Rauscher and others. University of Denver, Denver Research Institute, Denver, Colo. June 60. Contract AT(11-1)-742. 56p. Order from LC. Mi $3.60, ph $9.30. TID-6694

The metallographic preparation of plutonium and its alloys at Los Alamos, by K. Imlah and E. M. Cramer. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Feb 58. Decl. September 12, 1960. 14p. Order from LC. Mi $2.40, ph $3.30. TID-6764

Effect of temperature on yielding in single crystals of the hexagonal Ag-Al intermetallic phase. Technical report no. 1, by J. Mote and others. University of California, Materials Research Laboratory, Berkeley, Calif. June 60. Contract AT(11-1)-34. 41p. Order from LC. Mi $3.30, ph $7.80. TID-6794

The pebble bed reactor program. Current fuel element developments and their effects on the pebble bed reactor development program. Sanderson and Porter, New York, N.Y. May 60. Decl. September 23, 1960. Contracts AT(30-1)-2207 and AT(30-1)-2378. 37p. Order from LC. Mi $3.00, ph $6.30. TID-6809

Molybdenum, niobium, tantalum, tungsten and uranium oxide in the journal literatures of the USSR, 1955-June 1960, by C. J. Wensrich. University of California, Lawrence Radiation Laboratory, Livermore, Calif. Sep 60. Contract W-7405-eng-48. 32p. Order from LC. Mi $3.00, ph $6.30. UCRL-6110

Quarterly metallurgical progress report, no. 9 for the period of October 1, 1960 to December 31, 1960, by M. L. Wright. U. S. Department of Interior, Bureau of Mines, Albany Metallurgy Research Center, Albany, Ore. Dec 60. Contract AT(11-1)-599. 24p. Order from OTS. $1.00. USBM-U-783

Furnace brazing of Zircaloy, by E. R. Slaughter. Westinghouse Electric Corporation, Bettis Plant, Pittsburgh, Pa. Jan 59. Decl. March 30, 1960. Contract AT(11-1)-GEN-14. 24p. Order from LC. Mi $2.70, ph $4.80. WAPD-TM-172

Zirconium highlights. Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, Pittsburgh, Pa. May 60. Contract AT-11-1-GEN-14. 22p. Order from LC. Mi $2.70, ph $4.80. WAPD-ZH-24

Zirconium highlights. Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, Pittsburgh, Pa. Oct 60. Contract AT-11-1-GEN-14. 40p. Order from LC. Mi $3.00, ph $6.30. WAPD-ZH-25

Thermoelectric nuclear fuel element progress report no. 20 for February 1960, by G. R. Kilp and others. Westinghouse Electric Corporation, Atomic Power Department, Pittsburgh, Pa. Mar 60. Contract AT(30-3)-500. 15p. Order from LC. Mi $2.40, ph $3.30. WCAP-1513

Thermoelectric nuclear fuel element progress report no. 22 , by G. R. Kilp and others. Westinghouse Electric Corporation, Atomic Power Department, Pittsburgh, Pa. May 60. Contract AT(30-3)-500. 21p. Order from LC. Mi $2.70, ph $4.80. WCAP-1565

Thermoelectric nuclear fuel element monthly progress report no. 26 covering the period August 1960, by G. R. Kilp and others. Westinghouse Electric Corporation, Atomic Power Department, Pittsburgh, Pa. Sep 60. Contract AT(30-3)-500. 14p. Order from LC. Mi $2.40, ph $3.30. WCAP-1630

Meteorology

Surface temperature anomalies in mountain area weather analysis, by J. W. Reed. Sandia Corporation, Albuquerque, N. Mex. Jan 61. 17p. Order from OTS. 50 cents. SC-4546(RR)

Particle Accelerators and High-Voltage Machines

Electrode damage caused by sparks in vacuum, by C. A. Harris. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. Nov 60. Contract W-7405-eng-48. 31p. Order from OTS. 75 cents. UCRL-9487

Physics

Some physics calculations on the performance of large fast breeder power reactors, by S. Yiftah and D. Okrent. Argonne National Laboratory, Argonne, Ill. Dec 60. Contract W-31-109-eng-38. 32p. Order from OTS. 75 cents. ANL-6212

A study of the diffusive motions of liquids by means of cold neutron scattering experiments, by H. Palevsky. Brookhaven National Laboratory, Upton, N. Y. 1960. 22p. Order from LC. Mi $2.70, ph $4.80. BNL-4934

Utilization of experimental magnet power supplies, by W. W. Merkle. Brookhaven National Laboratory, Upton, N. Y. Sep 60. 2p. Order from LC. Mi $2.40, ph $ 3.30. BNL-5040

Method for applying transmission and ρ-vs-E corrections in the determination of σ_{2200} by the Macklin-deSaussure experiment, by E. C. Halbert and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. Aug 59. 45p. Order from LC. Mi $3.30, ph $7.80. CF-59-8-85

Some elementary results concerning escape probabilities of particles of fixed range generated in spheres, by M. Tobias. Oak Ridge National Laboratories, Oak Ridge, Tenn. Sep 60. 5p. Order from LC. Mi $1.80, ph $1.80. CF-60-9-44

Ion energy distribution, energy degradation, and exponentiation criteria in a plasma formed by beam trapping and charge transfer, by D. J. Rose. Oak Ridge National Laboratory, Oak Ridge, Tenn. Sep 60. 23p. Order from LC. Mi $2.70, ph $4.80. CF-60-9-112

The absorption and scattering of radiation in random aggregates of pebbles, by N. M. Smith, Jr. Oak Ridge National Laboratory, Oak Ridge, Tenn. 1948. Decl. September 1, 1960. Contract W-7405-eng-26. 64p. Order from LC. Mi $3.90, ph $10.80. CNL-21(Rev.)

Progress report for January, February, March 1960 to the United States Atomic Energy Commission. Columbia University, Pegram Nuclear Physics Laboratories, New York, N. Y. 1960. Contract AT(30-1-GEN-72. 47p. Order from LC. Mi $3.30, ph $7.80. CU(PNPL)-203

Progress report for April, May , June 1960 to the United States Atomic Energy Commission. Columbia University, Pegram Nuclear Physics Laboratories, New York, N. Y. 1960. Contract AT-30-1-GEN-72. 49p. Order from LC. Mi $3.30, ph $7.80. CU(PNPL)-205

A preliminary report on measurements of diffusion parameters in water by the pulsed-neutron method, by W. M. Lopez and others. General Atomic Division, General Dynamics Corporation, San Diego, Calif. Sep 60. Contract AT (04-3)-167. 20p. Order from LC. Mi $2.40, ph $3.30. GA-1584

Slow neutron inelastic scattering and neutron thermalization, by M. Nelkin. General Atomic Division, General Dynamics Corporation, San Diego, Calif. Sep 60. Contract AT-04-3-167. 48p. Order from LC. Mi $3.30, ph $7.80. GA-1689

Incurrent on a black body, by J. Devooght. General Dynamics Corporation, General Atomic Division, San Diego, Calif. Sep 59. Contract AT (04-3)-314. 27p. Order from LC. Mi $ 2.70, ph $4.80. GAMD-1013

Epithermal absorption by control rods of variable blackness, by J. Devooght. General Dynamics Corporation, General Atomic Division, San Diego, Calif. Oct 59. Contract AT(04-3)-314. 29p. Order from LC. Mi $2.70, ph $4.80. GAMD-1050

IBM 650 program for the calculation of capture-scattering and total cross-sections for S-, P- and D-wave neutrons, by C. Crafton and B. Roos. General Dynamics Corporation, General Atomic Division, San Diego, Calif. Feb 60. Contract AT(04-3)-187. 20p. Order from LC. Mi $2.40, ph $3.30. GAMD-1251

Shielding properties of ordinary concrete as a function of temperature, by E. G. Peterson. Hanford Atomic Products Operation, Richland, Wash. Aug 60. Contract AT(45-1)-1350. 39p. Order from OTS. $1.00. HW-65572

Measurement of negative k_{ex} for a graphite uranium lattice in the PCTR, by E. Z. Block and D. E. Wood. Hanford Atomic Products Operation, Richland, Wash. Dec 60. Contract AT(45-1)-1350. 24p. Order from OTS. 75 cents. HW-67179

Leakage of neutrons from bare subcritical plutonium systems, by B. C. Clark and J. L. Carter. Hanford Atomic Products Operation, Richland, Wash. Dec 60. Contract AT(45-1)-1350. 16p. Order from OTS. 50 cents. HW-67691

An application of perturbation theory to reactor kinetics-transfer functions for a two-node model, by E. C. Hansen. Knolls Atomic Power Laboratory, Schenectady, N. Y. Feb 60. Contract W-31-109-Eng-52. 20p. Order from LC. Mi $2.70, ph $4.80. KAPL-M-ECH-4

Estimate of the design useful life of the SAR-PTR reactor pressure vessel head. (Based on stresses at the edge of the central hole), by F. Panlilio and R. Eisenstadt. Knolls Atomic Power Laboratory, Schenectady, N. Y. June 60. Contract W-31-109-eng-52. 23p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-FP-1

A counter arrangement to facilitate the averaging of radioactivity issuing from long plate or strip like elements, by G. B. Gavin and others. Knolls Atomic Power Laboratory, Schenectady, N. Y. Feb 60. Changed from OFFICIAL USE ONLY May 3, 1960. Contract W-31-109-Eng-52. 17p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-GBG-10

Closure properties on oscillation matrices with applications, by G. J. Habetler and E. P. Shelly. Knolls Atomic Power Laboratory, Schenectady, N. Y. Aug 60. Contract W-31-109-Eng-52. 15p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-GJH-4

BHT-M: An IBM digital computer program to calculate boiling heat transfer of steam generators, by H. Harden. Knolls Atomic Power Laboratory, Schenectady, N. Y. July 60. Contract W-31-109-Eng-52. 32p. Order from LC. Mi $3.00, ph $6.30. KAPL-M-NPA-15

TCI-an auxiliary one dimensional transient conduction code for use with the art, spy and ter reactor design codes, by J. W. Millard. Knolls Atomic Power Laboratory, Schenectady, N. Y. Sep 59. Contract W-31-109-Eng-52. 59p. Order from LC. Mi $3.90, ph $10.80. KAPL-M-S3G-RES-69

Collected reports on fission cross section of U^{237} in thermal neutron, intermediate neutron, and degraded fission neutron spectra, by G. A. Cowan. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Jan 55. Decl. May 11, 1960. Contract W-7405-eng-36. 66p. Order from LC. Mi $3.90, ph $10.80. LA-1669

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U. S. DEPARTMENT OF COMMERCE FIELD OFFICES

SERVE THE BUSINESS COMMUNITY

The Department of Commerce maintains Field Offices to enable the business community to avail itself locally of Government facilities designed to promote commerce. Working closely with various units in the Department and, when necessary, with other Government agencies, the Field Offices provide business services to manufacturers, wholesalers, retailers, trade publications, trade associations, advertising agencies, research groups, financial institutions, and exporters and importers.

Experienced personnel will gladly assist in the solution of specific problems, explain the scope and meaning of regulations administered by the Department, and provide practical assistance in the broad field of domestic and foreign commerce. Field offices act as official sales agents of the Superintendent of Documents, and maintain an extensive business reference library containing periodicals, directories, publications and reports from official as well as private sources.

Among the many services which businessmen have found of value are:

GENERAL

- Management and business aids
- Establishing a new business

BASIC ECONOMIC DATA

- Census data, with national and often State and regional breakdowns, on manufacturing, wholesaling, retailing, service industries, employment and unemployment, population, housing, agriculture
- Basic records of national income and product, regional trends, balance of payments, foreign aid

MARKETING AND DISTRIBUTION

- Development and maintenance of markets
- Distribution channels, facilities and services
- Marketing and distribution statistics

PRODUCTION

- Modernization of plant processes and other technological aids
- Development of new products
- Government-owned patents for free license
- Commodity standards

FOREIGN TRADE AND INVESTMENT

- Tariff and exchange regulations
- Import and export quotas, licensing regulations
- Statistics on imports and exports
- Investment and trade opportunities abroad
- Economic conditions in foreign countries

COOPERATIVE OFFICES

To make the services of the Department of Commerce more widely available, agreements have been entered into with more than 750 Chambers of Commerce, Manufacturers Associations, and similar business groups under which these organizations have become official Cooperative Offices of the Department. If specific information is not on hand in the Cooperative Office, your problem will be referred to the nearest Departmental field office.

Department Field Offices

Albuquerque, N. Mex., U. S. Courthouse, Phone: CHapel 7-0311.
Atlanta 3, Ga., 604 Volunteer Bldg., 66 Luckie St., NW. JAckson 2-4121.
Boston 9, Mass., U. S. Post Office and Courthouse Bldg. CApitol 3-2312.
Buffalo 3, N. Y., 504 Federal Bldg., 117 Ellicott St. TL 3-4216.
Charleston 4, S.C., Area 2, Sergeant Jasper Bldg., West End Broad St. Phone: RAymond 2-7771.
Cheyenne, Wyo., 207 Majestic Bldg., 16th St. and Capitol Ave. Phone: 634-2731.
Chicago 6, Ill., Room 1302, 226 W. Jackson Blvd. ANdover 3-3600.
Cincinnati 2, Ohio, 809 Fifth Third Bank Bldg., 36 East Fourth Street. DUnbar 1-2200. Ext. 344.
Cleveland 1, Ohio, Federal Reserve Bank Bldg., E. 6th St. and Superior Ave., CHerry 1-7900.
Dallas 1, Tex., Room 3-104 Merchandise Mart. RIverside 8-5611.
Denver 2, Colo., 142 New Customhouse. KEystone 4-4151.
Detroit 26, Mich., 438 Federal Bldg. WOodward 3-9330.
Greensboro, N. C., 407 U. S. Post Office Bldg. Phone: BRoadway 3-8234.
Houston 2, Tex., 610 Scanlan Bldg., 405 Main St. CApitol 2-7201.
Jacksonville 1, Fla., 425 Federal Bldg. ELgin 4-7111.
Kansas City 6, Mo., Room 2011, 911 Walnut St. BAltimore 1-7000.
Los Angeles 15, Calif., Room 450, 1031 S. Broadway. RIchmond 9-4711.
Memphis 3, Tenn., 212 Falls Bldg. JAckson 6-3426.
Miami 32, Fla., 408 Ainsley Bldg., 14 N.E. First Ave., FRanklin 7-2581.
Minneapolis 1, Minn., 319 Metropolitan Bldg. Federal 2-3211.
New Orleans 12, La., 333 St. Charles Ave. 529-2411.
New York 1, N. Y., Empire State Bldg. LOngacre 3-3377.
Philadelphia 7, Pa., Jefferson Bldg., 1015 Chestnut St. WAlnut 3-2400.
Phoenix, Ariz., 137 N. Second Ave. ALpine 8-5851.
Pittsburgh 22, Pa., 107 Sixth St. GRant 1-5370.
Portland 4, Oreg., 217 Old U.S. Courthouse & P.O. Bldg. CApitol 6-3361.
Reno, Nev., 1479 Wells Ave. Phone: 2-7133.
Richmond 19, Va., 309 Parcel Post Bldg. MIlton 4-9471.
St. Louis 1, Mo., 910 New Federal Bldg. MAin 1-8100.
Salt Lake City 1, Utah, 222 SW. Temple St. EMpire 4-2552.
San Francisco 11, Calif., Room 419 Customhouse. YUkon 6-3111.
Savannah, Ga., 235 U. S. Courthouse and P. O. Bldg. ADams 2-4755.
Seattle 4, Wash., 809 Federal Office Bldg., 909 First Ave. MUtual 2-3300.

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